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SUMMARY

Introduction

This Environmental Impact Statement (EIS) analyzes the environmental consequences of six alternatives (including the No Action and Preferred Alternatives) for reclaiming the Jackpile-Paguate uranium mine. The mine is located on three tribal leases within the Laguna Indian Reservation, about 40 miles west of Albuquerque, New Mexico. The leaseholder, Anaconda Minerals Company, mined from 1953 to 1982. Out of a total of 7,868 leased acres, 2,656 acres were disturbed by mining. This disturbance includes three open pits, 32 waste dumps, 23 protore (sub-grade ore) stockpiles, four topsoil stockpiles and 66 acres of buildings and roads.

The lease terms and Federal regulations give the Department of the Interior (DOI) the authority to require reclamation of the minesite. The two main DOI agencies involved in this project are the Bureau of Land Management (BLM) and the Bureau of Indian Affairs (BIA). The BLM acts as the overall technical adviser while the BIA is responsible for the surface aspects of reclamation.

The public scoping process was used to focus on the major issues to be considered in this EIS. The two major issues identified were ensuring human health and safety and reducing radioactive releases.

There are no Federal or State regulations or standards for reclaiming uranium mines so a range of alternatives are evaluated in this document. These alternatives are: 1) No Action 2) Green Book Proposal 3) DOI Proposal (with Monitor and Drainage Options) 4) Laguna Proposal 5) Anaconda Proposal and 6) Preferred Alternative.

Description of the Alternatives

No Action Alternative

For this EIS, the No Action Alternative would mean that no reclamation work would be performed. Anaconda would continue their security program to prevent unauthorized entry and they would continue to operate an environmental monitoring program in perpetuity. This alternative is not considered reasonable for this project due to the need to protect public health and safety.

Green Book Proposal

The Green Book Proposal was originally developed by Anaconda Minerals Company but was subsequently replaced by the 1985 Multiple Land Use Reclamation Plan on August 19, 1985. The Green Book is being carried forward in the Final EIS for continuity of impact analysis and consistency with the DEIS.

The open pits would be backfilled to at least three feet above ground water recovery levels as projected by Dames and Moore, 1983. All highwalls would be scaled to remove loose material. The rim of Gavilan Mesa would be cut back by mechanical means or blasting and the base of the highwall would be buttressed with waste and overburden. Waste dump slopes would be reduced to between 2:1 and 3:1; most slopes would be terraced. Jackpile Sandstone exposed by resloping would be covered with four feet of overburden and one foot of topsoil. All protore and waste material lying within 200 feet of the Rios Paguate and Moquino would be removed. Facilities would either be removed or cleaned up and left intact. All disturbed areas (pit bottoms, waste dumps, old roads, etc.) would be topsoiled and seeded. Reclamation would be considered complete when the weighted average for basal cover and production on revegetated sites equals or exceeds 70 percent of that found on comparable reference sites. The post- reclamation monitoring period would be a minimum of three years.

DOI Proposal (Monitor Option and Drainage Option)

This alternative was developed by the DOI. It is based on a series of technical reports, contracted studies and fiel data. Although similar to the Green Book Proposal in overall concept, it varies in important details.

Because of concerns over the environmental impacts of either ponded water or salt build-up in the open pits, DOI has identified two options for treatment of the pit bottoms: 1) a Monitor Option which would backfill the pits with protore, excess material from waste dump resloping and soil cover. Due to the excess material (approximately 19 million cubic yards), the estimated backfill elevations of the pit floors could be 40 to 70 feet higher than the Green Book proposed minimum. The pits would remain as closed basins, in which case the potential build-up of salt and saline water in the soils of the pit bottoms would be monitored. If soil problems are observed, additional backfill and revegetation would be required. The monitoring period would be of sufficient duration to determine the stable future water table conditions; and 2) a Drainage Option which would restore the natural mode of overland runoff from the pit areas. Backfill volumes and elevations would be approximately the same as for the Monitor Option, but none of the pits would be left as closed basins. Open channels would be constructed with a slope equal to or flatter than local natural watercourses to convey runoff from the pit areas to the Rio Paguate. This would avoid ponded water or undrained saline soils on the reclaimed minesite.

Laguna Proposal

This alternative was developed by the Pueblo of Laguna in consultation with their technical consultants. In May 1986, the Pueblo provided the DOI with details and/or changes to the Laguna Proposal which are reflected in the Final EIS.

Under this proposal, all pits would be backfilled 10 above groundwater recovery levels projected by Dames and Moore, 1983. In general, the top 15 feet of each highwall would be cut to a 45 degree angle. With few exceptions, waste dump slopes would be reduced to 3:1. Remove all contaminated material within 100 feet of the Rio Paguate. Remove waste dumps 50 feet back from the Rio Moquino and armor the toes of the dumps with riprap. Minesite facilities would be handled essentially the same as under the DOI's Proposal except that the rail spur would remain intact. Topsoiling, seeding techniques and other reclamation measures would be the same as DOI's Proposal. The post-reclamation monitoring period would vary from 3 to 20 years.

Anaconda Proposal

The Jackpile and South Paguate open pits would be backfilled to an extent that would prevent chronic free-water ponding with groundwater levels controlled in the backfill by phreatophytic vegetation. The North Paguate open pit would be made into a water storage reservoir by diverting the Rio Paguate through the pit. The rest of Jackpile and North Paguate pit highwalls would be scaled or trimmed back a distance of 10 feet at a 3:1 slope. No additional modification of the South Paguate pit highwall is proposed. Waste dump slope modifications and topdressing requirements would vary. All Jackpile Sandstone and waste material would be moved back 50 feet from the Rios Paguate and Moquino. All buildings and other surface structures would be left intact where it is safe to do so. Revegetation success would be based on a comparison of the entire revegetated area relative to an analogous reference area on a weighted average basis. Revegetated areas would be sampled for the third year after the last seeding or reseeding effort by or for Anaconda and year-to-year thereafter until success criteria is met.

Preferred Alternative

Pits would remain as closed basins. They would be backfilled to at least 10 feet above the Dames and Moore (1983) projected groundwater recovery levels. In general, the top 15 feet of each highwall would be cut to a 45 degree angle. All soil at the top of the highwall would be sloped 3:1. With few exceptions, waste dump slopes would be reduced to 3:1. There are two options for stream stabilization: Option A - to remove all material within 200 feet of the Rios Paguate and Moquino, and construct a concrete drop structure across the Rio Moquino and Option B: to remove all contaminated material within 100 feet of the Rio Paguate and to remove all waste dumps within 50 feet of the Rio Moquino and armoring the toes of the dumps with riprap. Facilities would either be removed or cleaned up and left intact. All disturbed areas (pit bottoms, waste dumps, old roads, etc.) would be topsoiled and seeded. Reclamation would be considered complete when revegetated sites reach 90 percent of the density, fequency, foliar cover, basal cover and production of undisturbed reference areas. The post-reclamation monitoring period would vary for each parameter.

Environmental Consequences of the Alternatives

No Action Alternative

Mineral resources in the P15/17, NJ-45 and P-13 underground areas would remain accessible. Normal erosion would cause significant losses of all protore outside the pits. Gavilan Mesa would eventually collapse and bury the protore buttress at its base.

The North and South Paguate pit highwalls would be stable. Gavilan Mesa is only marginally stable and would eventually fail.

All 32 waste dumps would eventually experience mass failure resulting in blocked drainages, alteration of stream courses, increased stream sediment loads and decreased surface water quality.

Ground above the P-10 decline could experience sudden and significant subsidence. Unsealed underground openings would present physical and radiological hazards.

For the population within a 50-mile radius of the minesite, the absolute risk model predicts 15 additional radiation-induced cancer deaths over a 85-year period, of which only 0.3 would be lung cancer.

There would be perpetual surface water loss of 200 acre-feet per year. Water quality in the rivers would decrease over time due to erosion of protore piles and waste dumps. Water ponded in the open pits would have elevated levels of virtually all constituents.

Ground water would double in conductivity as it flowed through mine materials. Up to 50 acres of saline ponds would exist in the pit bottoms.

Arroyo headcutting would eventually erode into the bases of I, Y, Y2 and FD-3 dumps resulting in increased sediment loads to the rivers.

Paguate Reservoir would continue to receive sediment at a rate of 22 acre-feet per year.

The Rios Paguate and Moquino could migrate laterally and erode the adjoining waste dumps causing increased sediment load and possibly increased levels of total dissolved solids (TDS), heavy metals and radioactive elements in the rivers.

Mean waste dump erosion would be 79 tons per acre per year resulting in increased sediment load to the rivers and a deterioration of surface water quality.

Total Suspended Particulate (TSP) levels could exceed Federal and State standards for short periods. This would present an aesthetic

Headcuts would be armored to slow erosion, but the armoring would become ineffective due to siltation and bypassing and erosion would continue.

Sedimentation of Paguate Reservoir would be reduced by reclamation.

The removal of waste dumps 200' back from the centerline of the Rios Paguate and Moquino would provide a buffer against lateral migration and bank caving and thus reduce the possibility of adverse water quality impacts.

Mean total waste dump erosion would be 26 tons per acre per year (a 61 percent reduction from the No Action Alternative).

TSP levels would be within Federal and State standards. Since all radiological material would be covered there would be no radiological air quality health impacts.

Soil erosion rates would be reduced. Vegetative cover would lead to increases in wildlife populations. However, revegetated sites with only 70 percent of the basal cover and production of native reference areas would be less productive than natural sites and less capable of supporting populations of native and domestic herbivores.

Improved access to cultural sites could lead to increased vandalism as well as providing easier access for religious purposes.

Visual resource quality would be enhanced compared to the No Action Alternative.

Reclamation would temporarily increase employment and income.

Energy usage would be 292,000 kilowatt hours and 5.4 million gallons of fuel. Reclamation would require 201 man-years of labor. There could be 30.2 equipment use accidents.

DOI Proposal (Monitor and Drainage Options)

Specifications are proposed to control ground vibration and air blast effects. No blast related damage expected.

Impacts on mineral resources would be the same as the Green Book Proposal except that extra highwall stabilization techniques would lessen the chance of Gavilan Mesa collapsing on the protore buttress.

All highwalls would be scaled to reduce rockfall hazards. The top 10 feet of any soil on the North and South Paguate highwall crests would be cut back to a 3:1 slope to prevent piping. The South Paguate pit highwall would be fenced to limit access to the crest. Recontouring Gavilan Mesa would increase its safety factor and lessen the chance of mass failure.

problem and possibly a health risk since radioactive particulates could be eroded from the exposed protore piles.

Soil erosion rates would be high. Meager and scattered vegetative re-establishment would continue by secondary succession on habitable sites. Many disturbed areas would remain permanently barren. Wildlife populations would be low.

There would be no impacts to cultural resources. Access would remain limited.

Visual resource quality would remain poor.

Socioeconomic conditions would remain as they are.

Green Book Proposal

No specifications to mitigate the effects of blasting are proposed. Possible damage to the homes in Paguate Village could occur.

All mine entries would be sealed and their resources would become inaccessible. All protore would be placed in the open pits and would not be lost to erosion. Gavilan Mesa would eventually collapse and bury the protore buttress at its base.

All highwalls would be scaled to reduce rockfall hazards. The North and South Paguate pit highwalls would be stable. Modifications to Gavilan Mesa would make it only slightly more stable than under the No Action Alternative and it would fail.

Thirteen waste dumps would fail and 12 could fail. Environmental consequences would be the same as the No Action Alternative.

All underground openings would be sealed thus eliminating the subsidence and radiological hazards.

After reclamation, lung cancer deaths would be 10 percent of the No Action Alternative. All other cancer deaths would be reduced to less than 0.1 percent of the No Action Alternative.

There would be a one-time loss of 3,000 to 4,000 acre-feet of water which would percolate into the pit backfill. Evapotranspiration from the pit bottoms would remove about 200 acre-feet per year. Waste dump reclamation would reduce erosion which, in turn, would decrease TDS and heavy metal concentrations in the rivers. Up to 200 acres of intermittent ponds in the pit bottoms would be saline and unproductive for livestock use. Ground water would show a temporary increase in TDS and heavy metals. As the ground water reverts to a reducing state this leaching effect would decrease. Pit bottoms would retain a lens of shallow salt water.

FD-2, I and Y2 dumps would probably be stable. All other dumps would be stable.

All underground openings, including the P-10 decline, would be treated the same as the Green Book Proposal and would result in the same impacts.

Radiological health impacts would be the same as the Green Book Proposal.

There would be a one-time loss of 3,000 to 4,000 acre-feet of water which would percolate into the pit backfill. Gentler waste dump slopes would reduce erosion 50 percent compared to the Green Book Proposal resulting in a corresponding decrease in TDS and heavy metal concentrations in the rivers. For the Monitor Option, any ponded water in the pit bottoms would be eliminated by remedial action; ponds would not exist under the Drainage Option. For the Monitor Option, ground water quality would be better than under the Green Book Proposal due to reduced evapotranspiration from the pit bottoms. The Drainage Option would further reduce the likelihood of evapotranspiration from waterlogged soils.

An improved, no-maintenance armoring system would be used to stabilize all headcuts.

Sedimentation of Paguate Reservoir would be reduced by reclamation.

The removal of waste dumps 200' back from the centerline of the Rios Paguate and Moquino would result in the same impacts as described under the Green Book Proposal.

For both options, mean total waste dump erosion would be 13 tons per acre per year (an 82 percent reduction from the No Action Alternative and a 50 percent reduction from the Green Book Proposal). For the Drainage Option, sediment would be generated from approximately two square miles of externally draining pits.

TSP levels would be in the same range as for the Green Book Proposal.

Vegetative cover would be at least 90 percent of that on surrounding natural land. Reclaimed plant communities would therefore be more comparable with natural communities in terms of vegetative diversity and production, soil retention and carrying capacity for native and domestic herbivores.

Impacts to cultural resources would be the same as the Green Book Proposal.

Visual resource quality would be enhanced over the Green Book Proposal.

Impacts on employment and income would be the same as the Green Book Proposal.

Energy usage would be 290,000 kilowatt hours and 5.3 to 5.5 million gallons of fuel. Reclamation would require 198 (Monitor Option) and 203 (Drainage Option) man-years of labor. Equipment use accidents are estimated to be 29.8 for the Monitor Option and 30.5 for the Drainage Option.

Laguna Proposal

Most impacts would be the same as DOI's Proposal. The primary differences are noted below.

Limited blasting proposed. Specifications for limiting ground movement only. Air blast effects could result in broken windows and other minor damage.

Recovery of buried protore would be enhanced because the protore would be segregated by grade and the location plotted on maps for future reference.

Gavilan Mesa could eventually fail.

Waste dump FD-2 would be probably stable. All other waste dumps would be stable.

The arroyo west of waste dump FD-3 would be relocated and not need stabilization.

Waste dumps along the Rio Moquino would be pulled back 50' and the dump toes armored with riprap. This design would have surface water quality impacts similar to the Green Book Proposal but would be more maintenance dependent. Waste dumps along the Rio Paguate would be moved back 100' from the centerline of the river. This centerline distance would not provide the same degree of protection against lateral movement and erosion as provided for under the Green Book Proposal.

Since the top layer of backfill would be Mancos Shale, there is a possibility of temporary saturation of the topsoil/shale interface resulting in upward migration of salts which could inhibit plant growth.

Energy usage would be 292,000 kilowatt hours and 3.7 million gallons of fuel. Reclamation would require 137 man-years of labor. There could be 20.6 equipment use accidents.

Anaconda Proposal

No blasting would be proposed.

Preferred Alternative

Specifications are proposed to control ground vibration and air blast effects. No blast related damage expected.

Underground resources would be inaccessible. All protore would be buried in the open pits and not lost to erosion.

Rockfall hazards would be reduced by scaling the highwalls. North and South pit highwalls would be stable. Gavilan Mesa could eventually fail. North and South Paguate pit highwalls would be fenced to limit access to the crests.

FD-2 dump would be probably stable. All other waste dumps would be stable.

P-10 decline would be backfilled and sealed to eliminate any subsidence hazard. All underground openings would be sealed and all associated hazards eliminated.

Post-reclamation radiological impacts would be less than 0.1 percent of the No Action Alternative except for lung cancer deaths which would be reduced to 10 percent of the No Action Alternative.

There would be a one-time loss of 3,000 to 4,000 acre-feet of water which would percolate into the pit backfill. Water quality in the Rio Paguate would improve over time. Backfill would be added to the pit bottoms as necessary to control ponded water and saline soil. Ground water quality would improve due to evapotranspiration from the pit bottoms.

An improved, no maintenance armoring system would be used to stabilize all headcuts.

Sedimentation of Paguate Reservoir would be reduced by reclamation.

Two options are presented for stream stabilization: Option A - would remove all waste material 200' from the Rios Paguate and Moquino providing a buffer against lateral migration, bank caving and thus reducing water quality impacts described under the No Action Alternative, and Option B - would remove all waste material 50' from the Rio Moquino and use riprap for protection against erosion and flood events. Along the Rio Paguate, all contaminated material would be moved back 100 feet from the river. Option B is more mainteance dependent than Option A.

Mean total waste dump erosion would be 13 tons per acre per year (an 82 percent reduction from existing conditions). TSP levels are expected within Federal and State standards.

Vegetation cover would be at least 90 percent of that on surrounding natural communities in terms of vegetative diversity and production, soil retention and carrying capacity for native and domestic herbivores.

For the short-term, recovery of protore would be enhanced. Over the long-term, protore would be lost to erosion. For underground deposits and mine entries, the impacts would be the same as the Green Book Proposal.

The North and South Paguate pit highwalls would be stable; Gavilan Mesa could eventually fail. Lack of fencing and scaling could be hazardous.

Thirteen waste dumps would fail resulting in the impacts described under the No Action Alternative.

The minimal topsoil cover on the protore piles and a 70 percent revegetative success criteria would not ensure a stable plant community over the long-term. Failure to provide for a stable plant community would result in increased erosion rates and subsequent release of radiological materials into the air and water. Mitigation of these impacts would require extensive maintenance and rehabitation.

The total evaporative losses from the reclaimed pit bottoms and the North Paguate water storage reservoir would be greater than the perpetual 200 acre-feet per year of the No Action Alternative.

The impacts of arroyo headcutting would be the same as the Green Book Proposal.

Sedimentation of Paguate Reservoir would be reduced by reclamation.

Since waste dumps would only be moved back 50' from the centerlines of the Rios Paguate and Moquino, lateral migration of the rivers could lead to increased TDS, heavy metal, and possibly radionuclide concentrations.

Mean total waste dump erosion would be 21 tons per acre per year (a 73 percent reduction from the No Action Alternative).

TSP levels would be within Federal and State standards. Over the long-term, soil cover on protore piles would erode exposing radiological materials to the air.

For areas outside the pits, impacts would be the same as the Green Book Proposal. Phreatophytes may not survive over the long-term due to surface salt build-up.

Impacts to cultural and visual resources would be the same as the Green Book Proposal.

Impacts on employment and income would be the same as the Green Book Proposal.

Energy usage would be 292,000 kilowatt hours and 2.1 million gallons of fuel. Reclamation would require 7 man-years of labor. There could be 11.6 equipment use accidents.

Improved access to cultural sites could lead to increased vandalism as well as providing easier access for religious purposes.

Visual resource quality would be enhanced compared to other reclamation proposals.

Reclamation would temporarily increase employment and income.

Energy usage would be 290,000 to 292,000 kilowatt hours and from 3.7 to 5.3 million gallons of fuel. Reclamation would require 137 to 198 man-years of labor. There could be 20.6 to 29.8 equipment use accidents.

Chapter 1
description of the alternatives

INTRODUCTION

History and Background

The Jackpile-Paguate uranium mine is located on the Laguna Indian Reservation, 40 miles west of Albuquerque, New Mexico (Map 1-1). The mine was operated by Anaconda Minerals Company, a division of the Atlantic Richfield Company. Mining operations were conducted continuously from 1953 through early 1982. The mine was closed because of depressed uranium market conditions, and studies are underway to determine how best to permanently reclaim it.

Mining operations were conducted under three uranium mining leases between Anaconda and the Pueblo of Laguna (Map 1-2). The leases cover approximately 7,868 acres, as shown in Table 1-1 below:

TABLE 1-1

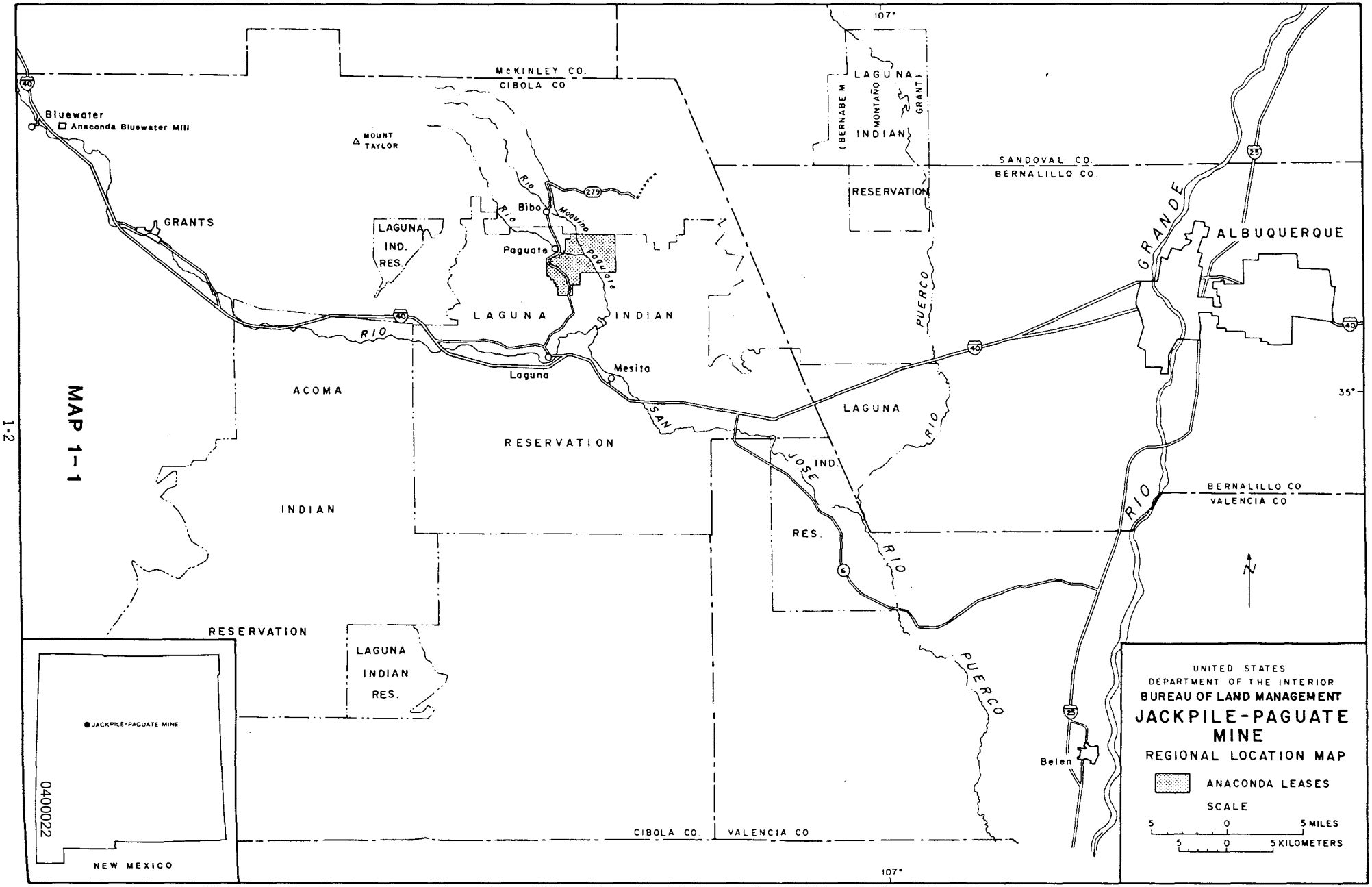
JACKPILE-PAGUATE URANIUM MINE LEASES

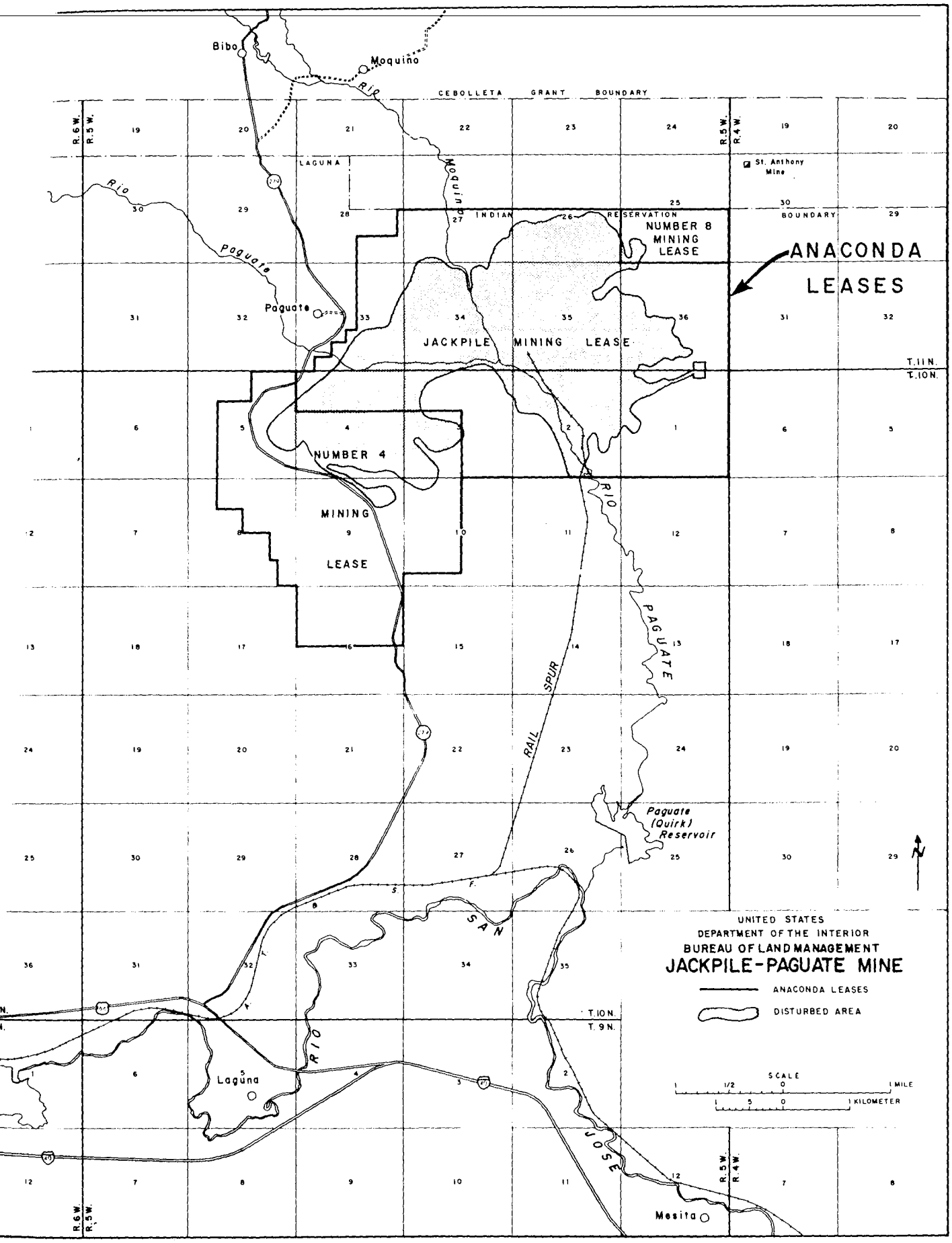
Lease Number	Date Signed	Size (Acres)
Jackpile	May 7, 1952	4,988
4	July 24, 1963	2,560
8	July 6, 1976	320
Total		7,868

Mining operations were conducted from three open pits and nine underground mines. Open pit mining was conducted predominantly with large front-end loaders and haul trucks. The overburden, consisting of topsoil, alluvium, shale and sandstone was blasted or ripped, removed from the open pits, and placed in waste dumps. The uranium ore was segregated according to grade and stockpiled for shipment to the mill. In the later years of mining, material conducive to plant growth was stockpiled for future reclamation, and some overburden and ore-associated waste was placed in the mined-out areas of the pits as backfill.

Underground mining was conducted by driving adits, or declines, to the ore zone. Drifts were driven through the ore zone, and the ore removed by modified room and pillar methods. Ventilation holes were drilled to maintain a fresh supply of air. Mine water was collected in sumps and pumped to ponds in the open pits. Waste rock was placed in waste dumps, and the ore was stockpiled for shipment to the mill.

During the 29 years of mining, approximately 400 million tons of earth were moved within the mine area, and about 25 million tons of ore were transported from the site via the Santa Fe Railroad to Anaconda's Bluewater Mill, 40 miles west of the mine (Map 1-1).


MAP 1-1
1-2
McKINLEY CO.
CIBOLA CO
Bluewater
Anaconda Bluewater Mill
MOUNT TAYLOR
GRANTS
LAGUNA IND. RES.
Rio Moquino
Bibo
Paguate
Paguate
LAGUNA INDIAN
RIO
Laguna
Mesita
ACOMA
RESERVATION
INDIAN
RESERVATION
LAGUNA INDIAN RES.
SAN JOSE IND. RES.
LAGUNA
RIO
PUERCO
107°
LAGUNA (BERNABE MONTAÑO GRANT) INDIAN RESERVATION
SANDOVAL CO
BERNALILLO CO.
RIO GRANDE
ALBUQUERQUE
35°
BERNALILLO CO
VALENCIA CO
RIO PUERCO
Belen
CIBOLA CO.
VALENCIA CO
107°
JACKPILE-PAGUATE MINE
NEW MEXICO
0400022
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
JACKPILE-PAGUATE MINE
REGIONAL LOCATION MAP
ANACONDA LEASES
SCALE
5 0 5 MILES
5 0 5 KILOMETERS



MAP 1-2

0400023

The mining operations resulted in 2,656 acres of surface disturbance as shown in Table 1-2.

TABLE 1-2

SURFACE DISTURBANCE

Features	Acres Disturbed
Open Pits	1,015
Waste Dumps	1,266
Protore Stockpiles	103
Topsoil Stockpiles	32
Support Facilities & Depleted Ore Stockpiles	240
TOTAL:	2,656

Additional acreage (unquantified) was disturbed by the drilling of exploration holes. Visual A, pocketed in the back of this Environmental Impact Statement (EIS), displays the mine complex as it presently exists.

Anaconda ceased all mining operations on March 31, 1982, but continues to provide security at the site to prevent unauthorized entry, and continues to operate an environmental monitoring program.

Anaconda advised the Department of the Interior (DOI) and the Pueblo of Laguna in April 1980 that open pit operations would terminate in February 1981 and subsequently submitted a reclamation plan to the DOI on September 11, 1980. Anaconda submitted a revised plan (Green Book Proposal) on March 16, 1982. On August 19, 1985, Anaconda submitted a preliminary version of a new reclamation plan entitled the 1985 Multiple Use Reclamation Plan for the Jackpile-Paguate Uranium Mine. This plan was submitted in final form on October 4, 1985. Anconda stated that this new plan rendered the 1982 Green Book Plan obsolete and withdrew it from further consideration in the EIS process. The Green Book is being carried forward in the Final EIS but is no longer endorsed by Anaconda.

Anaconda's leases are administered by the Bureau of Indian Affairs (BIA), and the mining and reclamation operations are supervised by the Bureau of Land Management (BLM). Both of these agencies are within DOI.

Purpose and Need for Reclamation

Reclamation of the Jackpile-Paguate uranium mine is necessary because:

1. The site is presently a public health and safety hazard;

2. Additional and more serious hazards would develop if the site is not reclaimed; and

3. The mining lease terms and Federal regulations (25 CFR Parts 211 and 216, and 43 CFR Part 3570) require that reclamation be performed by the leaseholder.

This EIS assesses and compares the environmental impacts of four reclamation alternatives, including proposals developed by Anaconda, the Pueblo of Laguna and the DOI. The proposed action for this EIS is the review and approval of a reclamation plan for the Jackpile-Paguate uranium mine.

The lease terms and regulations require reclamation but do not contain specific goals or standards to guide the DOI's decision. Therefore, the DOI must consider various reclamation alternatives, and choose the one that is considered to be the most appropriate.

Scope of the EIS

The scope of this EIS is 1) the reclamation (restoration to productive use) of the Jackpile-Paguate uranium mine and the affected adjacent areas, and 2) mitigation of impacts resulting from reclamation.

Federal Trust Responsibility

Indian tribes and pueblos enjoy a unique status under Federal law based upon what has been characterized as a "guardian-ward" status. Morton v. Mancari, 417 U.S. 535,551 (1974); Cherokee Nation v. Georgia, 30 U.S. (5 Pet.), (1831). This is a judicially created fiduciary status that is loosely characterized by saying that the Secretary of the Interior has a "trust responsibility" to the Indians. Chambers, Judicial Enforcement of the Federal Trust Responsibility, 27 Stanford Law Review 1213, 1214 (1975). The trust responsibility arises out of statutes, treaties, executive orders and those situations where the Bureau of Indian Affairs (BIA) holds title to Indian land and administers it "in trust" for particular tribes. United States v. Mitchell, 445 U.S. 535 (1980); Cape Fox Corporation v. United States, No. 664-801 (Ct. Cl. filed December 27, 1983), Chambers, supra. The trust responsibility is a limited one that arises from and is limited by, the authorizing statute, treaty, or executive order, and it varies according to the particular relationship being examined. See North Slope Borough v. Andrus, 642 Fed. 589, 611 (D.C. Cir. 1980).

Due to the governing regulations and the Secretary of the Interior's trust responsibility to Indians (and in this action specifically to the Pueblo of Laguna), the DOI is responsible for determining the proper level of reclamation for the Jackpile-Paguate uranium mine.

Responsibilities

The BLM and BIA share joint responsibility for a decision on approval of a reclamation plan for the Jackpile-Paguate uranium mine. However, each agency has specific responsibilities with regard to reclamation as outlined below.

The BLM is responsible for authorizing the commencement and approving the completion of the Jackpile-Paguate uranium mine reclamation. The authorities for this action are the terms of the mining leases that require compliance with applicable Federal regulations. Specifically, they include the following:

1. 25 CFR Part 211, Leasing of Tribal Lands for Mining (formerly 25 CFR Part 171);

2. 25 CFR Part 216, Surface Exploration, Mining and Reclamation of Lands (formerly 25 CFR Part 177); and

3. 43 CFR Part 3570, Operating Regulations for Exploration, Development and Production (formerly 30 CFR Part 231).

The BLM is also responsible for authorizing any necessary changes in the ongoing reclamation operations and for preparing any corresponding environmental documentation that would be required.

The BIA is responsible for determining that the surface aspects of mine reclamation, including revegetation, have been completed in accordance with the Secretary's trust responsibility as well as established requirements. In conjunction with this determination, the BIA is responsible for authorizing partial or total release of any bonding requirements, and partial or total surrender of the involved mining leases. The authorities for these actions are various terms of the mining leases and the provisions of 25 CFR Parts 211 and 216.

Due to the effective dates of the three mining leases and applicable Federal regulations, disagreement exists between the involved parties about the applicability of some of these regulations to certain leases. Debate has also occurred about the interpretation of various lease terms. It is not intended that this EIS resolve any such disagreement or debate. This section of the EIS merely identifies the Federal regulations that relate to one or more of the mining leases, and indicates that the lease terms and those regulations assign certain responsibilities to the BLM and the BIA.

Interrelationships with Other Projects

The only related project planned is the realignment of State Highway 279 through the mine area. This project is dependent on State legislative appropriation. The realignment is scheduled to take place prior to or during reclamation. This project is not precluded by any of the alternatives addressed in this EIS nor would the realignment preclude implementation of any of the reclamation proposals.

ISSUES AND CONCERNS

During the initial stages of the EIS process, public meetings were held to determine the issues of greatest concern related to the mine reclamation project and possible reclamation measures. This process is called "scoping". The DOI reviewed all the comments raised during these meetings and selected those major issues to be addressed in this EIS. The criteria DOI used for selecting major issues were whether the concerns expressed were substantive, and whether the issues fell within the scope of this EIS as stated on p. 1-5. Issues that failed to meet both criteria were dropped from further evaluation. Issues which met the criteria were used to develop reclamation objectives which in turn would be used to evaluate alternatives. Public input received during the early stages of the scoping process and in subsequent public hearings on the DEIS revealed that the issues of blast damage to Paguate Village during mining operations and possible radiological contamination in Paguate Reservoir were primary concerns raised by the Pueblo of Laguna. However, data compiled to date has been inconclusive on both issues. Therefore, DOI considers these two areas of concern to be unresolved liability issues. A more detailed discussion of scoping activities is contained in Chapter 4 - Consultation and Coordination.

Issues Dropped from Further Evaluation

1. Investigate the possible psychological effects that the mining operations and mine closure had on the Laguna people. Rejected as not within the scope of this EIS.

The present socioeconomic conditions of the Laguna people and the socioeconomic impacts of the reclamation operations are discussed in this document. However, NEPA does not require, and no useful purpose would be served by analyzing the impacts of past mining and mine closure.

2. Investigate the possible health impacts that mining operations had on former miners and residents of Paguate Village. Rejected as not within the scope of this EIS.

The predicted health impacts to the workers performing reclamation and post-reclamation impacts to the Laguna people are discussed in this document. However, NEPA does not require, and no useful purpose would be served by analyzing the impacts of past mining and mine closure.

3. Protection of the remaining on-site uranium resources (protore and unmined deposits) and existing mine workings for future production. Rejected as not within the scope of this EIS.

Projection of economic conditions suitable for recovery of the remaining reserves is speculative. A new mining project is not precluded in any of the reclamation proposals, and it is recognized that the treatment of protore and existing mine workings under various alternatives could significantly affect future mining costs. This is briefly discussed to the extent possible under each alternative.

4. Allow future residential and farming use of the minesite. Rejected as being contrary to the reclamation objective of ensuring human health and safety.

Either of these activities would require disturbing reclaimed areas to a significant degree and therefore have the potential for releasing previously covered radioactive materials into the biosphere.

5. Develop national standards for the reclamation of uranium mines. Rejected as not within the scope of this EIS.

Subtitle C of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, directed the U.S. Environmental Protection Agency to promulgate regulations for the management of hazardous wastes. These regulations were issued, but they exclude mining wastes. Evaluation of this site-specific project does not preclude Congress from acting to designate mining wastes as hazardous materials nor does it prevent DOI from using regulations for other similar activities as guidelines.

Issues Evaluated

1. Radiological doses and health impacts to workers involved in reclamation, persons visiting the minesite, residents of Paguate Village and to the general public.

2. Non-radiological minesite hazards such as possible collapse of the underground entries and workings, collapse of abandoned mine buildings and hazards due to unstable highwalls and waste dumps.

3. Engineering the reclaimed land forms to ensure their long-term integrity and blend the visual characteristics of the minesite with the surrounding landscape.

4. Contamination of surface and ground waters.

5. Revegetation of the minesite to prevent erosion and facilitate post-reclamation land use (i.e., livestock grazing).

6. Backfilling or draining the open pits to prevent ponding of contaminated water.

7. Minimizing the concentration of airborne particulates during and after reclamation.

8. Protection of cultural, religious and archaeological sites within the minesite.

9. Socioeconomic impacts of reclamation on the Pueblo of Laguna.

10. Long-term environmental monitoring needs and procedures.

ALTERNATIVES ELIMINATED FROM DETAILED STUDY

The following is a list of the alternatives eliminated from detailed study, and a brief explanation as to why they were rejected:

1. Return the tailings from Anaconda's Bluewater uranium mill to the minesite. Rejected as not within the scope of this EIS.

The U.S. Nuclear Regulatory Commission has jurisdiction over uranium mill sites in the State of New Mexico. Return of the mill tailings to the minesite has not been included in any of the Company or Tribal proposals and is not provided for by the leases.

2. Construct a wind or solar energy project at the mine or develop the site as an industrial park. Rejected as not within the scope of this EIS.

Such projects are not precluded in any of the alternatives addressed, but developing new industries for the Pueblo of Laguna is an issue separate from reclamation of the minesite.

3. Completely backfill all open pits. Rejected as being not feasible and unnecessary.

The cost of backfilling all pits would exceed $200 million which is considered to be unreasonable. Also, studies thus far do not support that completely backfilling the pits is necessary.

4. Use the site as a source of gravel. Rejected as not within the scope of this EIS.

The alternatives addressed in this document neither make provisions for, nor preclude this use. Reserves of gravel are present throughout the area, and far exceed the expected demand. Reserves of gravel and fill also exist on the site, but any future development would have to assure that radiological material is not removed or uncovered.

5. Contain all solid wastes and liquids within the lease property. Rejected as technically impractical and inconsistent with the objective of restoring post-reclamation land use.

Managing the reclaimed mine for zero discharge of waste material using conventional control techniques (i.e., lining, capping and hydrodynamic control) would be extremely expensive, provide little environmental benefit over simpler methods and would require permanent maintenance. Such techniques would result in large areas of the mine being unsuitable for any other use.

ALTERNATIVES SELECTED FOR DETAILED STUDY

The scoping process indicated that reclamation of the Jackpile-Paguate uranium mine could be accomplished in several ways due to the interrelationships of various reclamation components (e.g., backfilling and resloping of waste dumps). However, since no specific standards

exist for uranium mine reclamation, either in regulations or lease terms, reclamation objectives were developed to assist in determining the most appropriate reclamation measures for the Jackpile-Paguate uranium mine. The primary goal of these objectives is to reclaim and stabilize the minesite to restore productive use of the land and to ensure that adverse environmental impacts are reduced to the extent possible.

The reclamation proposals will be evaluated with the intent of achieving as many of the objectives as possible while realizing that no single reclamation proposal could meet all the objectives completely and that compromises would be required. Using post reclamation land use for livestock grazing as the common denominator and taking into account the major issues identified during the scoping process, the following reclamation objectives, in order of importance, were developed:

1. Ensure human health and safety.

2. Reduce the releases of radioactive elements and radionuclei to as low as reasonably achievable.

3. Ensure the integrity of all existing cultural, religious and archaeological sites.

4. Return the vegetative cover to a productive condition comparable to the surrounding area.

5. Provide for additional land uses that are compatible with other reclamation objectives and that are desired by the Pueblo of Laguna.

6. Eliminate the need for post-reclamation maintenance.

7. Blend the visual characteristics of the minesite with the surrounding terrain.

8. Employ the Laguna people in efforts that afford them opportunities to utilize their skills or train as appropriate.

The reclamation alternatives (except for the No Action Alternative) approach the reclamation objectives differently. The following is a brief summary of the reclamation alternatives analyzed in this EIS. A more complete description of these proposals is given in Tables 1-3, 1-4 and 1-5.

No Action Alternative

For this EIS, the No Action Alternative would mean that no reclamation work would be performed. The area would be secured to prevent unauthorized entry and an environmental monitoring program would be operated. Additional requests by the Pueblo of Laguna to utilize certain facilities for storage could be accommodated, provided such use would be temporary and deemed safe.

This alternative is not feasible because the Secretary of the Interior cannot approve a plan which does not provide a reasonable measure of protection to public health and safety, and does not reduce environmental impacts to the extent possible. This alternative is included and analyzed only to provide a benchmark that would allow decisionmakers to compare the magnitude of environmental effects for a given range of alternatives.

Green Book Proposal

Note: The Green Book Proposal was originally developed by Anaconda Minerals Company but was subsequently replaced by the 1985 Multiple Land Use Reclamation Plan on August 19, 1985. The Green Book is being carried forward in the Final EIS for continuity of impact analysis and consistency with the DEIS.

The open pits would be backfilled to at least three feet above ground water recovery levels as projected by Dames and Moore, 1983. All highwalls would be scaled to remove loose material. The rim of Gavilan Mesa would be cut back by mechanical means or blasting and the base of the highwall would be buttressed with waste and overburden. Waste dump slopes would be reduced to between 2:1 and 3:1; most slopes would be terraced. Jackpile Sandstone exposed by resloping would be covered with four feet of overburden and one foot of topsoil. All protore and waste material lying within 200 feet of the Rios Paguate and Moquino would be removed. Facilities would either be removed or cleaned up and left intact. All disturbed areas (pit bottoms, waste dumps, old roads, etc.) would be topsoiled and seeded. Reclamation would be considered complete when the weighted average for basal cover and production on revegetated sites equals or exceeds 70 percent of that found on comparable reference sites. The post- reclamation monitoring period would be a minimum of three years.

DOI Proposal (Monitor Option and Drainage Option)

This alternative was developed by the DOI. It is based on a series of technical reports, contracted studies and file data. Although similiar to the Green Book Proposal in overall concept, it varies in important details.

Because of concerns over the environmental impacts of either ponded water or salt build-up in the open pits, DOI has identified two options for treatment of the pit bottoms: 1) a Monitor Option which would backfill the pits with protore, excess material from waste dump resloping and soil cover. Due to the excess material (approximately 19 million cubic yards), the estimated backfill elevations of the pit floors could be 40 to 70 feet higher than the Green Book proposed minimum. The pits would remain as closed basins, in which case the potential build-up of salt and saline water in the soils of the pit bottoms would be monitored. If soil problems are observed, additional backfill and revegetation would be required. The monitoring period would be of sufficient duration to determine the stable future water table conditions; and 2) a Drainage Option which would restore the natural mode

of overland runoff from the pit areas. Backfill volumes and elevations would be approximately the same as for the Monitor Option, but none of the pits would be left as closed basins. Open channels would be constructed with a gradient equal to or flatter than local natural watercourses to convey runoff from the pit areas to the Rio Paguate. This would avoid ponded water or undrained saline soils on the reclaimed minesite.

For both options, other aspects of reclamation would be the same. Highwall stability techniques would essentially be the same as the Green Book Proposal. With few exceptions, waste dump slopes would be reduced to 3:1, with no terracing. Treatment of Jackpile Sandstone and minesite facilities would be the same as the Green Book Proposal. Remove all protore and waste material lying within 200 feet of the Rios Paguate and Moquino; in addition, construct a permanent base or bridge on the Rio Moquino. All disturbed areas would be topsoiled and seeded. Reclamation would be considered complete when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover and production of undisturbed reference areas. The post-reclamation monitoring period would vary for each parameter.

Laguna Proposal

This alternative was developed by the Pueblo of Laguna in consultation with their technical consultants. In May 1986, the Pueblo provided the DOI with details and/or changes to the Laguna Proposal which are reflected in the Final EIS.

Under this proposal, all pits would be backfilled 10 above groundwater recovery levels projected by Dames and Moore, 1983. In general, the top 15 feet of each highwall would be cut to a 45 degree angle. With few exceptions, waste dump slopes would be reduced to 3:1. Remove all contaminated material within 100 feet of the Rio Paguate. Remove waste dumps 50 feet back from the Rio Moquino and armor the toes of the dumps with riprap. Minesite facilities would be handled essentially the same as under the DOI's Proposal except that the rail spur would remain intact. Topsoiling, seeding techniques and other reclamation measures would be the same as DOI's Proposal. The post-reclamation monitoring period would vary from 3 to 20 years.

Anaconda Proposal (1985 Multiple Land Use Reclamation Plan)

The Jackpile and South Paguate open pits would be backfilled to an extent that would prevent chronic free-water ponding with groundwater levels controlled in the backfill by phreatophytic vegetation. The North Paguate open pit would be made into a water storage reservoir by diverting the Rio Paguate through the pit. The rest of Jackpile and North Paguate pit highwalls would be scaled or trimmed back a distance of 10 feet at a 3:1 slope. No additional modification of the South Paguate pit highwall is proposed. Waste dump slope modifications and topdressing requirements would vary. All Jackpile Sandstone and waste material would be moved back 50 feet from the Rios Paguate and Moquino. All buildings and other surface structures would be left intact where it is safe to do

so. Revegetation success would be based on a comparison of the entire revegetated area relative to an analogous reference area on a weighted average basis. Revegetated areas would be sampled for the third year after the last seeding or reseeding effort by or for Anaconda and year-to-year thereafter until success criteria is met.

Preferred Alternative

Pits would remain as closed basins. They would be backfilled to at least 10 feet above the Dames and Moore (1983) projected groundwater recovery levels. In general, the top 15 feet of each highwall would be cut to a 45 degree angle. All soil at the top of the highwall would be sloped 3:1. With few exceptions, waste dump slopes would be reduced to 3:1. There are two options for stream stabilization: Option A - to remove all material within 200 feet of the Rios Paguate and Moquino, and construct a concrete drop structure across the Rio Moquino and Option B: to remove all contaminated material within 100 feet of the Rio Paguate and to remove all waste dumps within 50 feet of the Rio Moquino and armoring the toes of the dumps with riprap. Facilities would either be removed or cleaned up and left intact. All disturbed areas (pit bottoms, waste dumps, old roads, etc.) would be topsoiled and seeded. Reclamation would be considered complete when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover and production of undisturbed reference areas. The post-reclamation monitoring period would vary for each parameter.

SUMMARY OF IMPACTS

Table 1-6 presents a summary and comparison of environmental impacts for the reclamation proposals outlined in Tables 1-3 and 1-4. For more detailed impact analysis, refer to Chapter 3 - Environmental Consequences.

MITIGATING MEASURES

Mitigating measures have been incorporated into each of the reclamation proposals addressed in this EIS and additional measures have been identified through the EIS process. These measures are proposed stipulations to the final reclamation plan approved by the DOI. Any approved reclamation plan, including the preferred alternative, will require stipulations and monitoring to ensure compliance with reclamation measures and to minimize environmental impacts during reclamation. DOI personnel will be responsible for assuring that all reclamation criteria are met. This includes everything from verifying that the proper amount of backfill has been placed in the pits to collecting and reviewing radiological data. Details of the preferred monitoring plan are in Table 1-5. It is important to note that monitoring would reduce but not eliminate residual environmental impacts to the extent possible.

TABLE 1-3

SUMMARY OF RECLAMATION ALTERNATIVES

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Monitor and Drainage Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Pit Bottoms						
Backfill Levels	No Action	Backfill pit bottoms to at least 3 feet above the Dames and Moore (1983) projected ground water recovery levels as indicated below. A schematic diagram is shown in Appendix A (Figure A-1). Pit — Proposed Minimum Backfill Levels[a/] Jackpile — 5932 North Paguate — 5951 downgradient of cut-off[b/]; 5983 upgradient of cut-off South Paguate — 5986-5988 South Paguate (SP 20) — 6053 [a/] Excess material generated by reclamation could raise these minimum backfill levels. [b/] Refer to the Hydrology Section in Chapter 3 for explanation.	Backfill west end (PW 2/3 area) of North Paguate pit to elevation of 6045'. Initial backfill levels would be the same elevations as indicated in the Green Book Proposal. Excess materials from waste pile resloping and stream channel clearing could raise these levels by 40 to 70 feet. Two options are under consideration to prevent ponded water and/or salt build-up: 1) an option to monitor the future conditions of the pit bottoms and provide additional backfill, if necessary, and 2) an option to restore the natural mode of runoff by reshaping the pits to allow external drainage to the Rio Paguate. A schematic diagram of the backfilling sequence under the Monitor Option is shown in Appendix A (Figure A-1); the Drainage Option is shown in Appendix A (Figures A-2 and A-3). For both options, the higher backfill levels are a result of approximately 19 million cubic yards generated by waste dump resloping.	Backfill pit bottoms to at least 10 feet above the Dames and Moore (1983) projected ground water recovery levels as indicated below. A schematic diagram is shown in Appendix A (Figure A-4). Pit — Proposed Minimum Backfill Levels Jackpile — 5939' North Paguate — 5958' South Paguate — 5995' South Paguate (SP - 20) — 6060'	The Jackpile and South Paguate pits would be backfilled to an extent that would prevent chronic free water ponding with ground water levels in the backfilled controlled by phreatophytic vegetation. A schematic diagram is shown in Appendix A (Figure A-5). Pit — Proposed Minimum Backfill Levels Jackpile — 5848' North Paguate — Central pit to be used as water storage reservoir (30-40 acres). South Paguate — 5958' South Paguate (SP 20) — To extent needed	Pits would remain as closed basins. Backfill pit bottoms to at least 10 feet above the Dames and Moore (1983) projected ground water recovery levels as indicated below. A schematic diagram is shown in Appendix A (Figure A-1,DOI Proposal). Pit — Proposed Minimum Backfill Levels Jackpile — 5939' North Paguate — 5958' South Paguate — 5995' South Paguate (SP-20) — 6060' A ground water recovery level monitoring program would be implemented. Additional backfill would be added as necessary to control ponded water. The duration of the monitoring program would be a minimum of 10 years.
Backfill Materials	No Action	Would consist of protore, waste dumps H and J, and excess material obtained from waste dump resloping and stream channel clearing. These materials would be covered with 4 feet of overburden and 1 foot of topsoil.	Would consist of protore, waste dumps H and J, and excess material obtained from waste dump resloping and stream channel clearing. These materials would be covered with 3 feet of overburden and 2 feet of topsoil (i.e., Tres Hermanos Sandstone or alluvial material).	Same as Green Book Proposal except that materials would be covered with 4 feet of shale and 1 foot of topsoil.	Backfill materials in Jackpile and South Paguate pits would consist of Tres Hermanos sandstone. Dump J would be relocated to Jackpile pit. North Paguate pit to be used as a water storage reservoir.	Would consist of protore, waste dumps H and J, and excess material obtained from waste dump resloping and stream channel clearing. These materials would be covered with 3 feet of overburden and 2 feet of topsoil (i.e., Tres Hermanos Sandstone on alluvial material).
Stabilization	No Action	Reduce all backfill slopes no greater than 3:1. Construct surface water control berms within pit bottoms to reduce erosion and retain soil moisture for plant growth. These areas would then undergo surface shaping, topsoil application and seeding as outlined in the vegetation segment of this table.	Same as Green Book Proposal, except pit bottoms would be contour furrowed.	Same as DOI's Proposal. In addition, surface runoff would be directed to small retention basins in the pit bottoms.	All backfill would be sloped to a minimum of 3:1. Areas would then be topsoiled, contour furrowed, bermed and revegetated.	Reduce all backfill slopes no greater than 3:1. Construct surface water control berms within pit bottoms to reduce erosion and retain soil moisture for plant growth. Surface runoff would also be directed to small retention basins in the pit bottoms. All areas in the pits would then undergo surface shaping, topsoil application and seeding as outlined in the vegetation section of this preferred alternative.
Post Reclamation Access	No Action	Livestock and vehicle access to the pit bottoms would be provided through the use of existing or newly crested ramps.	Human and animal access to pit bottoms would be prevented. Livestock grazing would be prevented with the use of sheep-proof fencing due to the uncertainties of predicting radionuclide and heavy metal uptake into plants (forage).	Interior fencing (four strand barbed wire) would be constructed to aid in post-reclamation grazing management.	Smaller roads accessing pits would be covered with 12-18" of topsoil material as needed and re-vegetated.	Human and animal access to pit bottoms would be prevented. Livestock grazing would be prevented with the use of sheep-proof fencing due to the uncertainties of predicting radionuclide and heavy metal uptake into plants (forage).

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Monitor and Drainage Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Pit Highwalls						
Jackpile Pit Highwall	No Action	Stabilize by scaling and buttressing. Amount of buttressing material would be 3.8 million tons of waste, or in excess of the amounts needed for ground water protection. The overall slope of the buttress would not exceed 3:1. Alternate method of stabilization may consist of removing top of highwall by either blasting or hauling to an angle that would exhibit required stability. A schematic diagram is shown in Appendix A (Figure A-6).	Buttressing would be the same as Green Book Proposal. Additional treatment would consist of using blasting and mechanical methods to recontour the west face of Gavilan Mesa so that sandstone units would have a near vertical angle and shale units would be at their natural angle of repose. The upper 10 feet of alluvial cover at the highwall crest would also be sloped 3:1 to prevent slumping and piping. A schematic diagram is shown in Appendix A (Figures A-6 and A-7).	The top 15' of highwall would be cut to a 45 degree slope. All soil at the top of the highwall would be sloped 3:1. The highwall would be scaled to remove loose debris. A schematic diagram is shown in Appendix A (Figure A-7).	Pit wall crests would be scaled 10 feet back at 3:1. A schematic diagram is shown in Appendix A (Figure A-7). Roads leading to highwall areas would be removed by landshaping and revegetation.	The top 15' of highwall would be cut to a 45 degree slope. All soil at the top of the highwall would be sloped 3:1. The highwall would be scaled to remove loose debris. A schematic diagram is shown in Appendix A (Figure A-7).
North Paguate Pit Highwall	No Action	Scale top of highwall to remove loose rock and debris.	Same as Green Book Proposal. In addition, the upper 10 feet of alluvial cover at the highwall crest would be sloped 3:1 to prevent slumping and piping. A schematic diagram is shown in Appendix A (Figure A-7). The existing highwall fence may have to be realigned.	Same measures as Jackpile pit highwall. Additionally, the highwall would be fenced with 6-foot chain link.	Pit wall crests would be scaled 10 feet back at 3:1. A schematic diagram is shown in Appendix A (Figure A-7). Roads leading to highwall areas would be removed by landshaping and revegetation.	The top 15' of highwall would be cut to a 45 degree slope. All soil at the top of the highwall would be sloped 3:1. The highwall would be scaled to remove loose debris. A schematic diagram is shown in Appendix A (Figure A-7). Additionally, the highwall would be fenced with 6-foot chain link.
South Paguate Pit Highwall	No Action	Scale top of highwall to remove loose rock and debris.	Same as Green Book Proposal. In addition, the upper 10 feet of alluvial cover at the highwall crest would be sloped 3:1 to prevent slumping and piping. A schematic diagram is shown in Appendix A (Figure A-7). The south rim would also be fenced with 6-foot chain link.	Same measures as proposed for North Paguate pit highwall.	No additional highwall modification are needed. Roads leading to highwall areas would be removed by landshaping and revegetation.	The top 15' of highwall would be cut to a 45 degree slope. All soil at the top of the highwall would be sloped 3:1. The highwall would be scaled to remove loose debris. A schematic diagram is shown in Appendix A (Figure A-7). Additionally, the highwall would be fenced with 6-foot chain link.
Waste Dumps	No Action	Relocate waste dumps H and J to Jackpile pit as backfill. Reduce overall slopes between 2:1 and 3:1. Dumps which have Jackpile Sandstone on their outer surface and any Jackpile Sandstone exposed during resloping would be covered with 4 feet of overburden and 1 foot of topsoil. Cover dumps that do not contain Jackpile Sandstone on their outer surface with 1 foot of topsoil. Install system of terraces, berms and rock-lined drainage structures to control erosion. Additional surface treatment is outlined in the vegetation segment of this table. Table 1-4 contains complete descriptions of modifications and treatments proposed for each waste dump. A schematic diagram is shown in Appendix A (Figure A-8).	Relocate waste dumps H and J to Jackpile pit as backfill. Reduce most dump slopes to 3:1 or less and contour furrow all dump slopes; exceptions are noted in Table 1-4. Dumps which have Jackpile Sandstone on their outer surface and any Jackpile Sandstone exposed during resloping would be covered with 3 feet of overburden and 18 inches of topsoil. Cover dumps that do not contain Jackpile Sandstone on their outer surface with 18 inches of topsoil. Install berms on all dump crests to control erosion. Slightly slope all dump tops away from their outer slopes. Contour dump slopes so their toes are convex to prevent formation of major gullies on slopes. Additional surface treatment is outlined in the vegetation segment of table. Detailed modifications and treatments are presented in Table 1-4. A schematic diagram is shown in Appendix A (Figure A-9).	In general, most dump slopes would be reduced to 3:1, covered with 2 feet of shale, 1 foot of soil and contour furrowed. Dumps which do not have Jackpile sandstone on the surface would not be covered with 2 feet of shale but would be subject to all other requirements. Detailed modifications and treatments are presented in Table 1-4. A schematic diagram is shown in Appendix A (Figure A-10).	Relocate waste dump J to Jackpile pit as backfill. Waste dumps composed primarily of ore-associated waste would be sloped 3:1. These dumps would be topsoiled with 12"-18" of material and revegetated. All dump slopes located in closed water basins or draining into closed water basins would remain at angle of repose and not be topsoiled. All waste dump top surfaces which are not ore-associated waste would be capped with 12"-18" of topsoil and contour furrowed or land imprinted. A flat channel moisture conservation berm system would be constructed on dump areas. Detailed modifications and treatments are presented in Table 1-4. A schematic diagram is shown in Appendix A (Figure A-11).	Relocate waste dumps H and J to Jackpile pit as backfill. Reduce most dump slopes to 3:1 or less and contour furrow all dump slopes; exceptions are noted in Table 1-4. Dumps which have Jackpile Sandstone on their outer surface and any Jackpile Sandstone exposed during resloping would be covered with 3 feet of overburden and 18 inches of topsoil. Cover dumps that do not contain Jackpile Sandstone on their outer surface with 18 inches of topsoil. Install berms on all dump crests to control erosion. Slightly slope all dump tops away from their outer slopes. Contour dump slopes so their toes are convex to prevent formation of major gullies on slopes. Additional surface treatment is outlined in the vegetation segment of table. Detailed modifications and treatments are presented in Table 1-4. A schematic diagram is shown in Appendix A (Figure A-9).

TABLE 1-3 (Continued)

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Monitor and Drainage Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Protore Stock-Piles	No Action	Use all protore as backfill material in pit areas. Cover with 4 feet of overburden and 1 foot of topsoil.	Use all protore as backfill material in pit areas. Cover with 3 feet of overburden and 2 feet of Tres Hermanos Sandstone or alluvial material.	Same as Green Book Proposal. In addition, all protore would be segregated according to grade. The final location and thickness of the low-grade and high-grade protore would be surveyed and plotted on maps for future reference.	Protore would be left in present stockpile locations and stabilized. Small isolated piles would be consolidated into nearby larger piles and stabilized. Portions of stockpiles along active waterways would be relocated away from the stream area and be placed adjacent to the remainder of the pile or other existing piles.	Use all protore as backfill material in pit areas. Cover with 3 feet of overburden and 2 feet of Tres Hermanos Sandstone or alluvial material.
Site Stability and Drainage						
Stream Stability	No Action	Remove all protore and waste material lying within 200 feet of Rios Paguate and Moquino.	Same as Green Book Proposal. In addition, construct a permanent cement base or a flood-proof bridge on the Rio Moquino immediately above its confluence with Rio Paguate.	All contaminated soils and fill material within 100 feet of the Rio Paguate west of its confluence with the Rio Moquino would be excavated and relocated to the open pits. For the Rio Moquino, waste dumps S, T, U, N and N2 would be pulled back 50 feet from the centerline of the stream channel. The toes of these dumps would be armored with riprap. A concrete drop structure would be constructed across the Rio Moquino approximately 400 feet above the confluence with the Rio Paguate.	All Jackpile sandstone and overburden waste material would be moved back 50 feet from the steams' centerlines. The Rio Paguate would be diverted through North Paguate pit.	The stream stabilization designs as indicated below are both feasible, however Option A would be less maintenance dependent than Option B. Option A: Remove all material lying within 200 feet of Rios Paguate and Moquino. A concrete drop structure would be constructed across the Rio Moquino approximately 400 feet above the confluence with the Rio Paguate. Option B: All contaminated soils and fill material within 100 feet of the Rio Paguate west of its confluence with the Rio Moquino would be excavated and relocated to the open pits. For the Rio Moquino, waste dumps S, T, U, N and N2 would be pulled back 50 feet from the centerline of the stream channel. The toes of these dumps would be armored with riprap. A concrete drop structure would be constructed across the Rio Moquino approximately 400 feet above the confluence with the Rio Paguate.
Arroyo Headcutting	No Action	Armor arroyos south of waste dumps I, Y and Y2 to inhibit arroyo headcutting. Other headcuts encountered during reclamation would be stabilized by armoring. A schematic diagram is shown in Appendix A (Figure A-12).	Armor arroyos south of waste dumps I, Y and Y2, and the arroyo west of waste dumps FD-1 and FD-3. Other headcuts encountered during reclamation would be stabilized by armoring. A schematic drawing is shown in Appendix A (Figure A-13).	Armor arroyos south of waste dumps I, Y and Y2. Stabilization design same as DOI's Proposal. The arroyo on the north side of dumps FD-1 and FD-3 would be relocated to the north to enable the dumps to be regraded to 3:1.	Certain headcuts which have the potential of encroaching upon dumps would be armored or riprapped. Stabilization design would be the same as the Green Book Proposal.	Armor arroyos south of waste dumps I, Y and Y2, and the arroyo west of waste dumps FD-1 and FD-3. Other headcuts encountered during reclamation would also be stabilized by armoring. The preferred stabilization design is shown on Appendix A (Figure A-13).
Blocked Drainages	No Action	Remove waste dump J and protore stockpiles SP-17BC and SP-6-B to unblock ephemeral drainage on south side of minesite. Two blocked drainages north of FD-1 and F dumps would remain blocked. Remainder of minesite, excluding open pits, would drain to Rios Paguate and Moquino.	Same as Green Book Proposal except pit areas would drain to the Rio Paguate under the Drainage Option.	Remove waste dump J and protore stockpiles SP-17BC and SP-6-B to unblock ephemeral drainage on south side of minesite. The drainage north of dump FD-1 would be directed north and west into a reestablished arroyo. The drainage north of dump F would remain blocked.	Waste dump J would be relocated to Jackpile pit as backfill. The drainages on the north and south sides of Gavilan Mesa and behind protore stockpile SP-6-B would remain blocked.	Remove waste dump J and protore stockpiles SP-17BC and SP-6-B to unblock ephemeral drainage on south side of minesite. Two blocked drainages north of FD-1 and F dumps would remain blocked. Remainder of minesite, excluding open pits, would drain to Rios Paguate and Moquino.

TABLE 1-3 (Continued)

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Monitor and Drainage Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Surface Facilities/ Structures						
Lease No 1 (Jackpile Lease)	No Action	Remove all facilities including houses, offices, shops, sewage systems, the airstrip, parking areas and roads (except as noted under "Access Routes" below). Also remove all operational and maintenance equipment, including machinery and tools. Leave power lines and poles passing through Lease No. 1 and serving areas north of lease undisturbed; remove all others. Clear land surface (except pit highwalls and naturah outcrops) of radiological material (e.g., Jackpile Sandstone) until gamma readings of twice background or less are achieved. Then grade and seed areas.	Same as Green Book Proposal. However, the Pueblo of Laguna has requested that certain facilities on Lease No. 1 remain. The Department could approve this request provided the facilities were structurally sound and radiologically safe.	Demolish and remove all buildings on Lease No. 1 except the Geology building, school building, miner trsining center and buildings at Old Shop and the Open Pit offices. Radiological decontamination criteria and rehab measures same as Green Book Proposal.	All buildings, other surface structures and support facilities would be left intact where it is safe to do so.	Demolish and remove all buildings on Lease No. 1 except the Geology building, miner training center and buildings at Old Shop and the Open Pit offices. Clear land surface (except pit highwalls and natural outcrops) of radiological material (e.g., Jackpile Sandstone) until gamma readings of twice background or less are achieved. Then grade and seed areas.
Lease No. 4	No Action	Leave all structures and facilities associated with P-10 Mine and New Shop, including all buildings, roads, parking lots, sewage systems, power lines and poles. Remove all operational and maintenance equipment, including tools, machinery, supplies and the P-10 conveyor. Clear all permanent structures and land surfaces (except pit highwalls and natural outcrops) of radiological material until gamma readings of twice background or less are achieved. Then grade and seed areas. Remove non-salvageable contaminated buildings and materials to pit for disposal.	Same as Green Book Proposal.	Same as Green Book Proposal.	All buildings, other surface structures and support facilities would be left intact where it is safe to do so.	Leave all structures and facilities associated with P-10 Mine and New Shop, including all buildings, roads parking lots, sewage systems, power lines and poles. Remove all operational and maintenance equipment, including tools, machinery, supplies and the P-10 conveyor. Clear all permanent structures and land surfaces (except pit highwalls and natural outcrops) of radiological material until gamma reading of twice background or less are achieved. Then grade and seed areas Remove non-salvageable contaminated buildings and materials to pit for disposal.
Access Routes	No Action	Clear 4 major roads within minesite of radiological material and leave after reclamation for post-mining use. These access routes include: 1) access road from P-10 and New Shop to State Highway 279; 2) main road through mine; 3) road that passes between housing area and North Oak Canyon Mesa and then proceeds to P-10; and 4) road to Jackpile Well No. 4. Remove all other roads (except on Lease No. 4), then grade and seed the areas.	Same as Green Book Proposal.	Same as Green Book Proposal.	The 4 major roads which cross the lease areas would remain for post-reclamation access.	Clear 4 major roads within minesite of radiological material and leave after reclamation for post-mining use. These access routes include: 1) access road from P-10 and New Shop to State Highway 279; 2) main road through mine; 3) road that passes between housing area and Nor Oak Canyon Mesa and then proceeds t P-10; and 4) road to Jackpile Well No. 4. Remove all other roads (except on Lease No. 4), then grade ar seed the areas.
Water Wells	No Action	Leave Jackpile Well No. 4, P-10 Well, New Shop Well and Old Shop Well, and 3 wells and their associated sheltering structures (near housing area). Remove pumps, riser pipe, wiring and water storage tanks. Also leave wells established for future monitoring purposes. Cap all wells to prevent dust, soil and other contaminants from entering well casing.	Same as Green Book Proposal.	Same as Green Book Proposal.	All wells and associated structures/equipment would remain.	Leave Jackpile Well No. 4, P-10 We New Shop Well and Old Shop Well, a 3 wells and their associated shelt ing structures (near housing area) Remove pumps, riser pipe, wiring a water storage tanks. Also leave wells established for future monit ing purposes. Cap all wells to prevent dust, soil and other conta nants from entering well casing.

TABLE 1-3 (Continued)

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Monitor and Drainage Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Rail Spur	No Action	Remove and salvage rail spur from Santa Fe Railroad main line to Jackpile Mine. Remove underlying ballast material and relocate to one of mine pits. Grade roadbed to conform with local relief and then seed it. Demolish Quirk loading dock and haul it to pit. Clear reclaimed roadbed and loading dock of radiological material (i.e., ore spillage) until gamma readings of twice background or less are achieved.	Same as Green Book Proposal except the Department could approve the Pueblo's request to leave the rail spur intact. This approval would be contingent upon the rail spur being radiologically safe.	The rail spur would be left intact and cleared of radiological material until gamma readings of twice background or less are achieved. Demolish Quirk loading dock and haul it to pit.	Rail spur would remain intact with minimal radiological clean-up of spilled ore. Demolish Quirk loading dock and haul it to pit.	The rail spur would be left intact and cleared of radiological material until gamma readings of twice background or less are achieved. Demolish Quirk loading dock and haul it to pit.
Drill Holes	No Action	Drill holes would be identified by field investigations and review of existing drilling records. Upon resumption of reclamation activities, upper 5 feet of holes would be plugged with concrete.	All drill holes would be plugged according to the State Engineer's requirements. A 5-foot surface concrete plug would also be placed in each hole. Any cased holes would have the casing cut off at the surface. In addition, areas around drill holes would be seeded. Any exploration roads not wanted by the Pueblo would be reclaimed.	Same as DOI's Proposal.	Same as Green Book Proposal.	All drill holes would be plugged according to the State Engineer's requirements. A 5-foot surface concrete plug would also be placed in each hole. Any cased holes would have the casing cut off at the surface. In addition, areas around drill holes would be seeded. Any exploration roads not wanted by the Pueblo would be reclaimed.
Underground Modifications						
Ventilation Holes	No Action	Place 10-foot concrete surface plug in each vent hole. Secure plug by either steel pinning or belling out to prevent downward slippage. Contour and seed areas around vent holes.	Backfill vent holes with waste material (Dakota Sandstone and Mancos Shale) to within 10 feet of surface, and place 10-foot concrete surface plug. Secure plug by either steel pinning or belling out to prevent downward slippage. Contour and seed areas around vent holes.	Backfill vent holes with waste material (Dakota Sandstone and Mancos Shale) to within 6 feet of surface. Remove surface casing, install steel support pins in walls of vent holes, and pour 6-foot concrete plug from backfill to surface. Contour and seed areas around vent holes.	Same as Green Book. In addition, the vent holes would be bulkheaded.	Backfill vent holes with waste material (Dakota Sandstone and Mancos Shale) to within 6 feet of surface. Remove surface casing, install steel support pins in walls of vent holes, and pour 6-foot concrete plug from backfill to surface. Contour and seed areas around vent holes.
Adits and Declines	No Action	Construct concrete bulkhead approximately 680 feet below portal of P-10 decline. Backfill decline from bulkhead to ground surface with Dakota Sandstone and Mancos Shale. Place sufficient material over portal to allow for compaction and settling. Shape ground surface above buried portal then top-dress and seed. Bulkhead and backfill Alpine mine entry. Cover mine entries not previously plugged by backfilling.	Same as Green Book Proposal. Additionally, bulkhead and backfill H-1 mine adits and backfill adits at P-13 and NJ-45 mines.	Same as DOI's Proposal.	Stabilization of P-10 would be the same as Green Book Proposal. The NJ-45 adits would be bulkheaded and backfilled approximately 25 feet back from each entry.	Construct concrete bulkhead approximately 680 feet below portal of P-10 decline. Backfill decline from bulkhead to ground surface with Dakota Sandstone and Mancos Shale. Place sufficient material over portal to allow for compaction and settling. Shape ground surface above buried portal then top-dress and seed. Bulkhead and backfill Alpine mine entry. Cover mine entries not previously plugged by backfilling. Additionally, bulkhead and backfill H-1 mine adits and backfill adits at P-13 and NJ-45 mines.

TABLE 1-3 (Continued)

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Monitor and Drainage Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Revegetation Methods						
Top dressing	No Action	Following final sloping and grading, top dress areas to be planted with 1 foot of material composed primarily of Tres Hermanos Sandstone (stockpiled at three locations within minesite). In order to meet top dressing volume requirements, obtain additional material from topsoil borrow area comprising 44 acres. Following topsoil removal, contour disturbed borrow area, then fertilize, seed and mulch.	Same as Green Book Proposal except topsoil cover would be 24" in the pit bottoms and 18" throughout the rest of the minesite. An additional topsoil borrow area southeast of J and H dumps may be needed.	A minimum of one foot of topsoil would be placed on all disturbed areas. Additional soil for the northern portion of the mine would be obtained from the relocation of the arroyo on the north side of dump FD-1 and from a borrow site along the Rio Moquino immediately north of dumps S and T. Additional soil for the southern portion of the mine would be obtained from a borrow site southeast of dumps J and H.	Following final sloping and grading, topdress areas with 18" of topsoil.	Following final sloping and grading, top dress pit bottoms with 24", waste dumps with 18" and all other areas within the minesite with 12" of material composed primarily of Tres Hermanos Sandstone (stockpiled at three locations within minesite). In order to meet top dressing volume requirements for the northern portion of the minesite, obtain additional material from topsoil borrow area in the Rio Moquino floodplain comprising 44 acres. For the southern portion of the minesite, additional topsoil borrow material located east of J and H dumps may be needed. Following topsoil removal, contour disturbed borrow area, then fertilize, seed and mulch.
Surface Preparation	No Action	After applying top dressing, fertilize areas to be planted, followed by disking to a depth of 8 to 12 inches. Complete surface preparation, where conditions dictate, with compactor roller or sheepsfoot roller to create shallow depressions for water collection, water retention and erosion control.	Same as Green Book Proposal except all areas would be contour furrowed.	Soils would be conditioned by disking, mulching and adding soil nutrients as necessary. All slopes steeper than 5:1 would be contour forrowed.	After applying topdressing, areas would be fertilized and then disked. Contour furrowing or land imprinting may be used on sloping terrain.	After applying top dressing, fertilize areas to be planted, followed by disking to a depth of 8 inches and then contour furrow.
Seeding and Seed Mixtures	No Action	In most situations, plant seed mixture with rangeland drill. Broadcast seeding combined with hydromulching may be used on inaccessible sites or if determined to be more feasible than drilling. For both methods, seed mixture would consist mainly of native plant species possessing qualities compatible with post-grazing use and adapted to local environment. Following drill seeding, apply straw mulch at about 2 tons per acre, and crimp into place with a notched disk.	Before seeding operations begin, fence entire minesite to prevent livestock grazing. Seeding methods and mixtures same as for Green Book Proposal.	Same as DOI's Proposal.	Seeding method same as Green Book Proposal. See mixtures for pit bottoms would differ from mixtures proposed for rest of minesite. Application and treatment of straw mulch same as Green Book Proposal.	Before seeding operations begin, fence entire minesite to prevent livestock grazing. In most situations, plant seed mixture with rangeland drill. Broadcast seeding combined with hydromulching may be used on inaccessible sites or if determined to be more feasible than drilling. For both methods, seed mixture would consist mainly of native plant species possessing qualities compatible with post-grazing use and adapted to local environment. Following drill seeding, apply straw mulch at about 2 tons per acre, and crimp into place with a notched disk.

TABLE 1-3 (Continued)

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Monitor and Drainage Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Revegetation Success	No Action	Plant establishment would be considered successful when weighted average for basal cover and production on all revegetated sites equalled or exceeded 70 percent of weighted average for basal cover and production on comparable reference sites on undisturbed lands within lease areas (but no sooner than 3 years following seeding). Prevent livestock grazing until 70 percent comparability values are met. At end of 3-year monitoring period, if unsuccessful trend is shown, retreatment may be necessary to achieve success criteria. Success criteria are discussed under Flora in Chapter 3.	Using the Community Structure Analysis (CSA method), plant establishment would be considered successful when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover and production of undisturbed reference areas (but not sooner than 10 years following seeding). Prevent livestock grazing until 90 percent comparability values are met. At end of 10-year monitoring period, if unsuccessful trend is shown retreatment may be necessary to achieve success criteria. In the pit bottoms, vegetation would be sampled annually for radionuclide and heavy metal uptake.	Vegetation would be monitored and supplemented until the density and percent cover of the revegetated areas equals or exceeds 90 percent of the species density and cover of existing comparison test plots. Data would be collected for a minimum of 3 years following the completion of reclamation.	Revegetation success would be based on a comparison of the entire revegetated area relative to an analogous reference area on a weighted average basis. Revegetated areas would be sampled for the third year after the last seeding or reseeding effort by or for Anaconda and year-to-year thereafter until success criteria is met.	Using the Community Structure Analysis (CSA) or comparable method, plant establishment would be considered successful when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover and production of undisturbed reference areas (but not sooner than 10 years following seeding). Prevent livestock grazing until 90 percent comparability values are met. At end of 10-year monitoring period, if unsuccessful trend is shown retreatment may be necessary to achieve success criteria. In the pit bottoms, vegetation would be sampled annually for radionuclide and heavy metal uptake.
Monitoring	Continue Anaconda's present monitoring program	Continue present monitoring program during reclamation period and for minimum of 3 years thereafter. Monitoring activities to be continued would include: meteorologic sampling, air particulate sampling, radon sampling (ambient), radon exhalation sampling, gamma survey, soil and vegetation sampling, water monitoring and subsidence. Refer to Table 1-5 for details of the Green Book proposed monitoring program.	Same as Green Book Proposal, except the post-reclamation monitoring period would vary for each parameter. In addition, the monitoring program would be expanded to include: radon daughter levels (working levels) in in any remaining mine buildings and ground water recovery levels/salt build-up in the open pits. The ground water monitoring period would be of sufficient duration to determine the stable future water table conditions. Refer to Table 1-5 for details of DOI's proposed monitoring program.	Monitoring would be broken down into three phases: 1) monitoring during reclamation, 2) monitoring after reclamation, and 3) long-term monitoring. Refer to Table 1-5 for details of the Pueblos proposed monitoring program.	Similar to Green Book Proposal. Refer to Table 1-5 for details of Anaconda's proposed monitoring program.	The monitoring period would vary for each parameter. Monitoring activities to be continued would include: meteorologic sampling, air particulate sampling, radon sampling (ambient), radon exhalation sampling, gamma survey, soil and vegetation sampling, water monitoring and subsidence. In addition, the monitoring program would be expanded to include: radon daughter levels (working levels) in any remaining mine buildings and ground water recover levels/salt build-up in the open pits. The ground water monitoring period would be of sufficient duration to determine the stable future water table conditions. Refer to Table 1-5 for details of the preferred monitoring plan.
Security	Continue Anaconda's present security program to prevent unauthorized access.	Anaconda would continue to have full responsibility for mine access and security during reclamation and monitoring activities. However, security during monitoring phase would require cooperation from Pueblo of Laguna and BIA to prevent livestock grazing on revegetated sites.	Same as Green Book Proposal.	Same as Green Book Proposal.	Same as Green Book Proposal.	Control of minesite access and security would continue during reclamation and monitoring activities. However, security during monitoring phase requires cooperation from Pueblo of Laguna and BIA to prevent livestock grazing on revegetated sites.
Compliance	BLM and BIA would continue to ensure compliance with the present monitoring program and security measures.	DOI would monitor and inspect every aspect of reclamation activities to ensure compliance with all reclamation requirements.	Same as Green Book Proposal	Same as Green Book Proposal.	Same as Green Book Proposal.	DOI would monitor and inspect every aspect of reclamation activities to ensure compliance with all reclamation requirements.

TABLE 1-3 (Concluded)

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Monitor and Drainage Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Reclamation Completion	N/A	Reclamation considered complete with occurrence of the following: 1. When weighted average for basal cover and production on all revegetated sites equalled or exceeded 70 percent of weighted average for basal cover and production on comparable reference sites (but not sooner than 3 years following seeding); or 2. If livestock grazing occurred on any revegetated area before the above weighted average success criteria were met.	Reclamation would be considered complete when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover and production of undisturbed reference areas (but not sooner than 10 years following seeding). In addition, gamma radiation levels must be no greater than twice background over the entire minesite. Outdoor radon - 222 concentrations must be no greater than 3pCi/l. Radon daughter levels (working levels) in any remaining surface facilities must not exceed 0.03 WL.	Same as DOI's Proposal except a minimum of 3 years would be required before determining if vegetative success criteria were met. Although intensive minesite monitoring could end as little as three years after completion of reclamation operations, long-term monitoring and maintenance of site stability could continue indefinitely.	Reclamation considered complete with occurrence of the following: 1) If the revegetated areas meet or exceed the weighted acreage success criteria as described in the 1985 Plan; or 2) If livestock grazing occurs on any revegetated area prior to meeting the weighted acreage success criteria.	Reclamation would be considered complete when revegetated sites reach 90 percent of the density, frequency, foliar cover, basal cover and production of undisturbed reference areas (but not sooner than 10 years following seeding). In addition, gamma radiation levels must be no greater than twice background over the entire minesite. Outdoor radon - 222 concentrations must be no greater than 3pCi/l. Radon daughter levels (working levels) in any remaining surface facilities must not exceed 0.03 WL.
Post-Reclamation Land Uses	N/A	Livestock grazing. Specifically excluded are habitation, farming and construction of commercial or industrial facilities.	Limited Livestock grazing. Specifically excluded are habitation and farming.	Livestock grazing, light manufacturing, office space, mining and major equipment storage. Specifically excluded are habitation and farming.	Multiple land uses including: livestock grazing, fish and wildlife habitat development, water resource development and protection; recreational use and mineral resource accessibility.	Limited livestock grazing, light manufacturing, office space, mining and major equipment storage. Specifically excluded are habitation and farming.

TABLE 1-4

WASTE DUMPS AT THE JACKPILE-PAGUATE URANIUM MINE
(existing conditions, proposed modifications and treatments)

Existing Conditions					Proposed Modifications and Treatments				
Dump(s)	Acres	Reclaimed to Date[a]	Dump Composition	Present Slope (horizontal:vertical) -Mode Value-	Green Book Proposal[b]	DOI Proposal (Monitor and Drainage Options)[c]	Laguna Proposal[d]	Anaconda's Proposal[e]	Preferred Alternative [f]
A	23		Outer surface: mainly shales, mixed with some Tres Hermanos Sandstone (THS)	1.44:1	Slope 3:1	Same as Green Book Proposal	Same as Green Book Proposal	Same as Green Book Proposal; cut and fill balance (CFB) on slope	Slope 3:1
B	71		Outer surface: mainly shales mixed with some THS	1.50:1	Slope 3:1	Same as Green Book Proposal	Same as Green Book Proposal	Slope west and south sides 3:1 by CFB.	Slope 3:1
C	21	X	Topsoil: 24 inches THS mixed with some shales; Under topsoil: THS mixed with shales	1.60:1	No change--most of dump slope covered by sloping of dump FD-2.	Same as Green Book Proposal, except any slopes not covered by FD-2 would be sloped 3:1.	Same as DOI's Proposal	Same as Green Book Proposal	No change - except any slopes not covered by FD-2 would be sloped 3:1.
D	14	X	Topsoil: 24 inches THS mixed with some shales; Under topsoil: THS mixed with shales	1.64:1	No change	Slope 3:1	Same as DOI's Proposal	Same as Green Book Proposal	Slope 3:1
E	12	X	Topsoil: 24 inches THS mixed with some shales; Under topsoil: THS mixed with shales	1.38:1	No change	Slope 3:1	Same as DOI's Proposal	Same as Green Book Proposal	Slope 3:1
F	73	X	Topsoil: 18-24 inches THS mixed with some shales; Under topsoil: mainly shale with some THS and Jackpile Sandstone (JSS)	1.50:1	No change	Slope 3:1	Same as DOI's Proposal	Same as Green Book Proposal	Slope 3:1
FD-1	168		Entire dump: primarily shales with JSS and some THS on west end	1.45:1	Dump moved back approx. 200 feet from arroyo. One terrace with 2:1 intermediate slopes; over all slopes from 2.3:1 to 3:1;5-foot-high erosion-control berm placed between toe of dump and arroyo.	Dump moved back approx. 120 feet from arroyo. Boulder size talus left at toe of dump to stabilize arroyo against head-cutting; No terracing; slope 3:1.	The arroyo blocked by dump FD-1 would be re-located to the north and the dump sloped 3:1. Riprap would be placed on toe of dump.	No change on north side of dump; west side of dump moved back 50 feet from drainage and sloped 3:1. Slope material would be removed.	Dump moved back approx. 120 feet from arroyo. Boulder size talus left at toe of dump to stabilize arroyo against head-cutting; No terracing; slope 3:1.
FD-2	25		Entire dump: shales and THS	1.48:1	Two terraces with 2:1 intermediate slopes; overall slope 2.3:1; top of dump lowered about 50 feet.	Same as Green Book Proposal due to dump's height and restricted room in surrounding terrain.	Slope 2.7:1; top of dump lowered 50 feet.	Allow dump to gradually settle.	Slope 2.7:1; top of dump lowered 50 feet.

TABLE 1-4 (Cont'd)

Dump(s)	Acres	Reclaimed to Date[a]	Existing Conditions: Dump Composition	Existing Conditions: Present Slope (horizontal:vertical) -Mode Value-	Proposed Modifications and Treatments: Green Book Proposal[b]	Proposed Modifications and Treatments: DOI Proposal (Monitor and Drainage Options)[c]	Proposed Modifications and Treatments: Laguna Proposal[d]	Proposed Modifications and Treatments: Anaconda's Proposal[e]	Proposed Modifications and Treatments: Preferred Alternative[f]
FD-3	10		Outer surface: JSS, some shales and THS on slopes	1.40:1	Dump moved back about 200 feet from arroyo. One terrace with 2:1 intermediate slopes; overall slopes from 2.3:1 to 3:1; 5-foot high erosion-control berm placed between toe of dump and arroyo.	Dump moved back about 120 feet from arroyo. No terracing; slope 3:1.Boulder-size talus left at toe of dump to stabilize arroyo against headcutting.	Slope 3:1.	Move back 50 feet from arroyo. Slope 3:1 on east side of dump by CFB and west side by removal.	Dump moved back about 120 feet from arroyo. No terracing; slope 3:1. Boulder size talus left at toe of dump to stabilize arroyo against headcutting.
G	49	X	Topsoil: 18-24 inches THS mixed with some shales; Under topsoil: shales mixed with JSS exposed on surface prior to covering	1.39:1	No change	Slope 3:1	Same as DOI's Proposal	Same as Green Book Proposal	Slope 3:1
H	7		Outer surface: JSS and some shales	1.43:1	Dump removed and backfilled into Jackpile pit--underlying area reclaimed.	Same as Green Book Proposal	Same as Green Book Proposal	Slope 3:1 by CFB.	Dump removed and backfilled into Jackpile pit--underlying area reclaimed.
I	57	X	Topsoil: 18-24 inches THS; Under topsoil: shales mixed with JSS exposed prior to covering	1.75:1	Approx. 36 acres of slope to be modified by using one terrace with 2:1 intermediate slopes. Overall slope 2.2:1; 21 acres would remain at present configuration of 1.5:1.	Slope east portion 3:1; slope south portion 2.5:1.	Slope 3:1	Slope 3:1 by CFB on east and south sides.	Slope 3:1
J	15	X	Topsoil: 18-24 inches alluvial material taken from floodplain area; Under topsoil: JSS	1.37:1	Dump removed and backfilled into Jackpile pit--underlying area reclaimed.	Same as Green Book Proposal	Same as Green Book Proposal	Same as Green Book Proposal	Dump removed and backfilled into Jackpile pit--underlying area reclaimed.
K	22	X	Topsoil: 24 inches THS; Under topsoil: mainly THS mixed with shales	1.66:1	No change	Slope 3:1	North slope of dump pulled back 25 feet from escarpment; slope 3:1.	Same as Green Book Proposal	Slope 3:1
L	40	X	Topsoil: 24 inches THS; Under topsoil: mainly shales mixed with THS	4.45:1	Approx. 18 acres left to reclaim. Slopes now at 1.5:1 would be sloped 3:1.	Same as Green Book Proposal	Same as Green Book	Slope 3:1 by CFB.	Approx. 18 acres left to reclaim. Slopes now at 1.5:1 would be sloped 3:1.

Table 1-4 (Cont'd)

Dump(s)	Acres	Reclaimed to Date[a]	Dump Composition	Present Slope (horizontal:vertical) -Mode Value-	Green Book Proposal[b]	DOI Proposal (Monitor and Drainage Options)[c]	Laguna Proposal[d]	Anaconda's Proposal[e]	Preferred Alternative[f]
			Existing Conditions		Proposed Modifications and Treatments				
N	64		Outer surface: mixed shales and some THS	1.20:1	Dump moved back approx. 200 feet from Rio Moquino and slope 2:1 (no terraces); 5-foot-high erosion-control berm placed between toe of dump and Rio Moquino.	Same as Green Book Proposal except dump sloped 3:1.	Dump moved back from centerline of Rio Moquino and sloped 3:1, toe of dump covered with riprap. Riprap would extend from below the existing grade of the Rio Moquino to above the 100 year flood level.	Reduce small slopes on top surface 3:1 by CFB; move dump 50 feet back from stream centerline and reduce remaining slopes to 3:1 by removal.	Option A: Move dump back 200 feet from Rio Moquino and slope 3:1 or Option B: Dump moved back from centerline of Rio Moquino and sloped 3:1; toe of dump covered with riprap. Riprap would extend from below the existing grade of the Rio Moquino to above the 100 year flood level.
N2			Outer surface: mixed shales and some THS	1.66:1	Dump moved back 200 feet from Rio Moquino and slope 2:1 (no terraces); 5-foot high erosion-control berm placed between toe of dump and Rio Moquino.	Same as Green Book Proposal except dump sloped 3:1.	Same measures as N dump.	Move dump back 50 feet from stream centerline and slope 3:1 by removal.	Option A: Move dump back 200 feet from Rio Moquino and slope 3:1 or Option B: Dump moved back from centerline of Rio Moquino and sloped 3:1; toe of dump covered with riprap. Riprap would extend from below the existing grade of the Rio Moquino to above the 100 year flood level.
O,P, P1,P2	35	X	Topsoil: 24 inches THS; Under topsoil: mainly THS with limited amounts of shale	1.30:1	No change	Slope 3:1	Same as DOI's Proposal	Same as Green Book Proposal	Slope 3:1
Q	52		Outer surface: JSS mixed with some shales	1.55:1	Slope 3:1	Same as Green Book Proposal	Same as Green Book Proposal	Slope 3:1 by CFB.	Slope 3:1
R	14		Outer surface: shales mixed with some JSS	2.35:1	Slope 3:1	Same as Green Book Proposal	Same as Green Book Proposal	Slope 3:1 by CFB.	Slope 3:1
S	96	X	Topsoil: 24 inches THS; Under topsoil: THS with some shales	1.5:1	Southern 26 acres seeded and sloped 3:1. 60 acres would remain at present slope configuration of 1.5:1.	Slope 3:1.	Same measures as N Dump.	Slope 3:1 on south and southeast by CFB.	Option A: Slope 3:1 or Option B: Dump moved back from centerline of Rio Moquino and sloped 3:1; toe of dump covered with riprap. Riprap would extend from below the existing grade of the Rio Moquino to above the 100 year flood level.
South Dump	175		Outer surface: shales and THS on slopes	1.40:1	Dump moved back a minimum of 150 feet from arroyo (Oak Canyon). Overall slopes between 2:1 and 3:1; some areas with one terrace.	Dump moved back a minimum of 150 feet from arroyo and sloped 3:1.	Southern slope of South Dump would be pulled back 25 feet from arroyo and sloped 3:1.	No slope reduction; possibly hydroseed on slopes.	Southern slope of South Dump would be pulled back 25 feet from arroyo and sloped 3:1.

TABLE 1-4 (Concluded)

Existing Conditions					Proposed Modifications and Treatments				
Dump(s)	Acres	Reclaimed to Date[a]	Dump Composition	Present Slope (horizontal:vertical) -Mode Value-	Green Book Proposal[b]	DOI Proposal (Monitor and Drainage Options)[c]	Laguna Proposal[d]	Anaconda's Proposal[e]	Preferred Alternative [f]
T	27	X	Topsoil: 27 acres have 18-24 inches THS: Under topsoil: JSS and some shales exposed prior to covering. 5 acres have JSS and some shales on slopes.	1.45:1	Approx. 12 acres moved back about 200 feet from Rio Moquino. On 5 acres, slope between 2:1 and 2.4:1. Some areas with one terrace; 5-foot-high erosion-control berm placed between toe of dump and Rio Moquino; 10 acres would remain at present slope configuration of 1.5:1.	Dump moved back 200 feet from the Rio Moquino and sloped 3:1.	Same measures as N dump.	Move back 50 feet from stream centerline and slope 3:1 by removal.	Option A: Dump moved back 200 feet from the Rio Moquino and sloped 3:1. or Option B: Dump moved back from centerline of Rio Moquino and sloped 3:1; toe of dump covered with riprap. Riprap would extend from below the existing grade of the Rio Moquino to above the 100 year flood level.
U	61		Outer surface: JSS and some shales on slopes	1.45:1	Dump moved back approx. 200 feet from Rio Moquino and slope 2:1. Some parts of dump completely removed; south part with one terrace; 5-foot-high erosion-control berm placed between toe of dump and Rio Moquino.	Dump moved back 200 feet from Rio Moquino and slope 3:1.	Same measures as N dump.	Sames measures as T Dump.	Option A: Dump moved back 200 feet from Rio Moquino and slope 3:1. or Option B: Dump moved back from centerline of Rio Moquino and sloped 3:1; toe of dump covered with riprap. Riprap would extend from below the existing grade of the Rio Moquino to above the 100 year flood level.
V	51		Outer surface: JSS, shales and some THS on slopes	1.40:1	One terrace with 2:1 intermediate slopes; overall slope 2.2:1.	Slope 3:1	Same as DOI's Proposal	Slope 3:1 by CFB and removal	Slope 3:1
W	7		Outer surface: THS and shales	1.46:1	No change due to rock cover on slopes.	Slope 3:1	Same as Green Book Proposal	Slope 3:1 by CFB.	Slope 3:1
X	9	X	Topsoil: 18-24 inches THS; Under topsoil: JSS and some shales	No exterior slopes	No change.	Same as Green Book Proposal	Same as Green Book Proposal	Same as Green Book Proposal	No change
Y	30		Outer surface: JSS with some shales and THS	1.44:1	One terrace with 2:1 intermediate slopes; overall slope 2.3:1.	Slope 3:1	Same as DOI's Proposal	Slope 3:1 by CFB.	Slope 3:1
Y2	15	X	Topsoil: 18-24 inches of THS on top and none on slopes; Under topsoil: JSS and some shales exposed prior to covering	1.50:1	Two terraces with 2:1 intermediate slopes; overall slope 2.4:1.	Slope 2.5:1	Slope 3:1.	Slope 3:1 by CFB.	Slope 3:1

Source: Dump composition data from Anaconda Minerals Company 1982c and 1984a; present slope data from BLM 1984.

Notes: a/"Reclaimed to date" does not necessarily mean reclamation is complete. Previously reclaimed dumps proposed for additional treatment are indicated.

b/Green Book Proposal includes:
- 5-foot-high erosion control berms placed on all dump crests and terraces.
- Dump tops contoured to channel runoff to open-chute rock-lined drainage structures (dumps A, FD-1, FD-2, FD-3, I, N, O, P1, S, South Dump, T, U, V, Y and Y2).
- Dumps which have Jackpile Sandstone on their outer surface and any Jackpile Sandstone exposed during resloping would be covered with 4 feet of overburden and 1 foot of topsoil.
- Cover dumps that do not contain Jackpile Sandstone on their outer surface with 1 foot of topsoil.
- Boulder-sized material placed on slopes as necessary to help stabilize them.

c/DOI Proposal (Monitor and Drainage Options) includes:
- 5-foot-high erosion control berms placed on all dump crests and all dump tops sloped slightly away from their outer slopes.
- No drainage structures.
- All dump slopes would be contour furrowed.
- All dump slopes contoured so that their toes are convex (to protect slopes from erosion).
- Dumps which have Jackpile Sandstone on thier outer surface and any Jackpile Sandstone exposed during resloping would be covered with 3 feet of overburden and 18 inches of topsoil.
- Cover dumps that do not contain Jackpile Sandstone on their outer surface with 18 inches of topsoil.
- Boulder-sized material placed on slopes as necessary to help stabilize them.

d/Laguna Proposal includes:
-All dump tops sloped slightly away from their outer slopes; slopes would be a minimum of 50:1 and a maximum of 10:1.
-All dump slopes would be contour furrowed.
-No drainage structures.
-Where practical, dump slopes contoured so that their toes are convex.

e/Anaconda Proposal includes:
-A flat channel moisture conservation berm system would be constructed on dump areas.
-Contour furrowing or land imprinting would be used on all topsoiled waste piles which include backfilled waste.

f/Preferred Alternative includes:
- 5-foot-high erosion control berms placed on all dump crests and all dump tops sloped slightly away from their outer slopes.
- No drainage structures.
- All dump slopes would be contour furrowed.
- All dump slopes contoured so that their toes are convex (to protect slopes from erosion).
- Dumps which have Jackpile Sandstone on thier outer surface and any Jackpile Sandstone exposed during resloping would be covered with 3 feet of overburden and 18 inches of topsoil.
- Cover dumps that do not contain Jackpile Sandstone on their outer surface with 18 inches of topsoil.
- Boulder-sized material placed on slopes as necessary to help stabilize them.

TABLE 1-5

SUMMARY OF PROPOSED MONITORING PROGRAMS
[No. of Stations (S)/Monitoring Frequency (F)/Parameters (P)/Duration (D)]

Item	No Action Alternative	Green Book Proposal	DOI Proposal (Both Options)	Laguna Proposal	Anaconda Proposal	Preferred Alternative
Subsidence	S - 89 F - Quarterly P - Ground Movement D - In Perpetuity	S - 89 F - Quarterly P - Ground Movement D - During reclamation and 3 years thereafter	S - 89 F - Quarterly P - Ground Movement D - Until State Highway 279 is realigned	S - 63 F - Semi-annually P - Ground Movement D - 1 Year Minimum	S - Stations along State Highway 279 F - Semi-annually P - Ground Movement D - During reclamation and 3 years thereafter	S - 89 F - Quarterly P - Ground Movement D - Until State Highway 279 is religned
Surface Water[a/] Quality	S - 7 F - Monthly P - pH, conductivity, TDS, HCO_3, Cl, SO_4, Na, K, Ca, Mg, NO_3, F, SiO_2, Mn, As, Ba, Cd, Cr, Pb, Hg, Se, Cu, Fe, Zn, Mo, Ni, V, U and RA-226 D - In Perpetuity	S - 7 F - Monthly P - Same as No Action D - During reclamation and 3 years thereafter	S - 7 F - Same as Laguna Proposal P - Same as Laguna Proposal D - During reclamation and a minimum of 10 years thereafter	S - 7 F - Quarterly for GROUP A, Semi-annually for GROUP B P - GROUP A: pH, conductivity, TDS, temperature, HCO_3, Cl, SO_4, Na, K, Ca, Hg, NO_3, SiO_2, Mn, Fe, U(Natural), Ra-226 GROUP B: Same as GROUP A plus Ag, Al, As, B, Ba, Cd, CN, Co, Cr, Cu, F, Hg, Mo, N, Pb, PO_4, Se, V, Zn, Ra-228, Pb-210, Th-230 D - 1 Year Minimum	S - 7 F - Quarterly for GROUP C, Annually for GROUP D P - GROUP C: pH, conductivity, TDS, temperature, HCO_3, Cl, Mg, Mn, Na, K, SO_4, Fe, NO_3, F, SiO_2, U(Natural), Ra-226 GROUP D: Same as GROUP A plus Zn, Pb, Ni, Se, Ba, Cu, U(Natural) Ra-226 D - During reclamation and 3 years thereafter	S - 7 F - Quarterly for GROUP A, Semi-annually for GROUP B P - GROUP A: pH, conductivity, TDS, temperature, HCO_3, Cl, SO_4, Na, K, Ca, Mg, NO_3, SiO_2, Mn, Fe, U(Natural), Ra-226 GROUP B: Same as GROUP A plus Ag, Al, As, B, Ba, Cd, CN, Co, Cr, Cu, F, Hg, Mo, N, Pb, PO_4, Se, V, Zn, Ra-228, D - During reclamation and a minimum of 10 years thereafter
Ground Water[a/] Quality	S - 3 F - Monthly P - Same parameters as for surface water D - In Perpetuity	S - 3 F - Monthly P - Same as No Action D - During reclamation and 3 years thereafter	S - 17 F - Semi-annually for GROUP A, Annually for GROUP B P - Water levels plus GROUP A (See Surface Water - Laguna Proposal) GROUP B (See Surface Water - Laguna Proposal) D - During reclamation and a minimum of 10 years thereafter	S - 17 F - Same as DOI Proposal P - Same as DOI Proposal D - A minimum of 3 years following reclamation	S - 9 F - Quarterly for GROUP E, Annually for GROUP F P - GROUP E: water level, pH, conductivity, temperature, TDS, SO_4, U(Natural), Ra-226 GROUP F: Same as GROUP D identified for surface water plus water level, calcium, Al, As, B, Cr, Cd, Co, Hg, Mo, Ni, PO_4, Ag, V D - During reclamation and 3 years thereafter	S - 17 F - Semi-annually for Group A, Annually for Group B P - Water levels plus Group A D - During reclamation and a minimum of 10 years thereafter